PREVENTIVE CANCER SCREENING: SOCIAL DETERMINANTS OF PARTICIPATION IN MAMMOGRAPHY AND PAP TESTS

by

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ABSTRACT

The purpose of this thesis was to determine the extent to which social factors are influential in determining women's participation in cancer screening services in Prince George, British Columbia. Specifically, this thesis evaluated the association of age, income, education, work status, disability, marital status, and immigrant status with previous use of screening mammography for breast cancer and Pap tests for cervical cancer. Data were obtained from the 1994 National Population Health Survey which contained a sample of 416 women from the Prince George area. A series of logistic regression analyses were used to distinguish *ever* versus *never* screened, as well as recency of previous screening. Participation rates in screening mammography in Prince George are comparatively high, however no association was found between social factors and previous mammography use. This suggests women in Prince George are participating in mammography services regardless of social background. Participation rates in Pap test screening in Prince George are high and are similar to provincial averages; however, while a large percentage of women have been screened, this percentage varies across social groups. Immigrant women, single women, and women with less education are over represented among women who have never had a Pap test. In addition, older women are less likely to obtain recent screening when compared to younger women. These results imply the need to focus education and recruitment strategies for increasing participation Pap test screening at specific groups of women in Prince George.

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CHAPTER ONE: BACKGROUND

Introduction

In recent years, health researchers have followed a winding ideological path in efforts to define the concept of health. Traditionally defined in physiological terms, the concept of health evolved to include, first, individual-based psychological and lifestyle influences and, later, wider-ranging social and environmental influences (Pederson, O'Neill, & Rootman, 1994). Today, health has become a complex concept with a comprehensive list of determinants: age, race, class, and gender play important roles in determining the health of individuals (World Health Organization, 1984). An analysis of health from these perspectives has led to a shared understanding that, to a large extent, those from disadvantaged social groups tend to be less healthy than those from socially advantaged groups. Indeed, understanding health in the 90's has become more about social justice and inequities and less about hospitals and medicines.

When thinking about the health of women in this context, one can understand why it is that women suffer higher levels of illness and disability. In comparison to men, women have less education and lower incomes, are subjected to greater degrees of discrimination and are more likely to be affected by violence. From a social determinant perspective, women from disadvantaged social groups are doubly at risk for poor health. Ideally, efforts to improve women's health should be directed at alleviating social inequities; however, in light of the enormity of such a task, current efforts should, in part, be directed towards ensuring that health services reach all women, especially those at high risk. The purpose of this thesis is to determine the extent to which selected social factors are influential in determining women's participation in preventive health services. Specifically, this thesis will evaluate the association of selected social factors (age, income, education, work status, disability, marital status, and immigrant

status) with previous use of screening mammography and Pap test services in Prince George, British Columbia using data collected in the 1994 National Population Health Survey.

Note that the term 'social determinants' will be used throughout this thesis. The concept of social determinants of health is often used in health research, however, the term has not been well defined. A general definition is found in Smith: "the inequities of our society that make a person more susceptible to illness and disease." (Smith, 1993, p.7) The British Columbia (BC) Provincial Health Officer identifies the determinants of health to include "such wide ranging factors as income, stress, empowerment, personal-support networks, marital status, education and housing." (BC Provincial Health Officer, 1992, as cited in Smith, 1993, p.7). Essentially, the term 'social determinants' of health refers to the direct, indirect, and interacting influences of complex and wide-ranging social factors.

Breast and Cervical Cancer Prevention in British Columbia

National and Provincial Guidelines for Preventive Screening

Disease prevention has gained considerable attention in recent years. Clearly, the most proactive approach to improving health in populations is to prevent the occurrence and/or proliferation of disease. Prevention efforts are most commonly classified under a three-tiered system, as outlined by Pender (1987). The three levels are defined as follows:

- Primary prevention – "consists of activities directed toward decreasing the probability of specific illnesses or dysfunctions in individuals, families and communities, including active protection against unnecessary stressors." (p. 4)
- Secondary prevention – "emphasizes early diagnosis and prompt intervention to halt the pathological process, thereby shortening its duration and severity and enabling the individual to regain normal function at the earliest possible point." (p. 5)
- Tertiary prevention – "comes into play when a defect or disability is fixed, stabilized, or irreversible. Rehabilitation, the goal of tertiary prevention, is more than halting the

> disease process itself; it is restoring the individual to an optimum level of functioning within the constraints of the disability." (p. 5)

Following from this, services such as screening mammography and Pap tests are classified as secondary prevention measures; that is, emphasis lies in early detection of cancer so to stop the progression of the disease and increase chances for recovery and, ultimately, normal functioning.

Advances in preventive screening technologies have made it possible to substantially reduce mortality and morbidity rates due to cancer among women. Estimates suggest that regular mammography screening among women aged 50 to 69 can reduce breast cancer mortality up to 40% (Center for Disease Control and Prevention, 1996). Furthermore, it has been suggested that mortality due to cervical cancer can be completely eradicated among women aged 18 to 69 (Health Canada, 1998). Because of the slow progression of cervical cancer, regular screening means it is possible to detect all cases of cervical cancer before the disease causes illness and/or mortality (Canadian Task Force on the Periodic Health Examination, 1994).

The effectiveness of preventive screening for breast and cervical cancer is widely recognized and clinical recommendations regarding breast and cervical cancer screening reflect this. National screening guidelines come from The Canadian Task Force on the Periodic Health Examination (1994) which recommends women between the ages of 50 and 69 receive regular annual mammography screening. Provincial guidelines for mammography screening are similar: the Screening Mammography Program of BC recommends screening every two years after the age of 40 until the age of 79 (personal communication, S. Ottesen, August 20th, 1998).

Similarly, the Canadian Task Force on the Periodic Health Examination recommends screening for cervical cancer should begin annually at age 18 or following initiation of sexual activity; after two normal smears, screening should proceed every three years until the age of

69. The BC Cervical Cytology Program recommends screening begin at age 18 or on initiation of sexual activity, and after three normal smears, proceed every two years (personal communication, R. Nafer, November 12th, 1998).

For both breast and cervical cancer, women at high risk are recommended to increase the frequency of screening. The Canadian Task Force on the Periodic Health Examination (1994) describes the risk factors for breast cancer and cervical cancer as follows:

> Risk factors for *breast cancer* include hormonal, dietary and hereditary factors. Early menarche, late menopause and delayed first pregnancy are associated with higher risk. There is some evidence linking high intake of dietary fat to risk of breast cancer; family history, obesity, alcohol use, ionizing radiation and post menopausal estrogen replacement therapy have also been associated with increased risk, while the evidence for oral contraceptives is more controversial. (Canadian Task Force on the Periodic Health Examination, 1994, p. 788)
>
> The major factors found to be associated with the occurrence of *cervical cancer* are age of first sexual intercourse, number of consorts, smoking, low socio-economic status and possibly infections such as human papillomavirus. (Canadian Task Force on the Periodic Health Examination, 1994, p. 884)

Breast and Cervical Cancer Screening Programs in British Columbia

British Columbia has extensive and well-established screening programs. The British Columbia Cervical Cytology Screening Program (BCCCSP) was the first population-based cervical cancer screening program of its kind (Deschamps, Band, Hislop, Clarke, Smith, Ng, & Math, 1992). Since 1955, the program has provided free Pap tests to all female residents of BC (Deschamps et al., 1992). Similarly, the Screening Mammography Program of BC (SMPBC) was the first province-wide breast cancer screening program in Canada and has provided free mammography screening since 1988. Recent program expansions have included a number of mobile mammography vans allowing more than 95% of women in the province to be within an hour's drive of a screening facility (Clay, Hislop, Kan, Olivotto, & Warren-Burhenne, 1994). Both programs keep detailed records with linkages to the BC Cancer Registry allowing for a

comprehensive follow-up system in which a cancer screening history can be maintained for every woman participating in screening programs.

BC has been a clear leader in initiating cancer screening programs in Canada. Four provinces followed BC's lead in establishing provincial-wide mammography programs: Nova Scotia (1991), Ontario (1990), Saskatchewan (1990), and Alberta (1990) (DeGrasse, O'Connor, Boulet, Edwards, Bryant, & Breithaupt, in press). In 1990, BC was the first province to introduce mobile screening units so as to improve access for women living in rural parts of the province. Other provinces followed suit in 1991-1992. Furthermore, the SMPBC has a history of working to the full capacity of the program, meaning the program aims to screen approximately 100,000 women yearly and consistently fulfills this goal (DeGrasse et al., in press). This possibly indicates the effectiveness of the professional and public education tactics the SMPBC employs in encouraging women to participate. As of 1993, other provincial programs were working towards this goal.

Breast and Cervical Cancer Mortality and Morbidity in British Columbia

The development of the SMPBC and BCCCP reflect the acute need to address cancer mortality and morbidity among women in British Columbia. As in other developed countries, cancer has become a significant health concern. Breast cancer is the fourth leading cause of death among women in British Columbia (BC Vital Statistics, 1996). The Provincial Health Officer reports that breast cancer accounts for 30% of all new cases of cancer among women and 16% of cancer deaths among women in BC (BC Provincial Health Officer, 1997). Similarly, cervical cancer accounts for 2% of all new cancers and 1.5% of cancer deaths among women in BC (BC Provincial Health Officer, 1997). Although the cervical cancer rate is low when compared to other cancers (such as breast cancer), a population mortality of 1.5% seems unacceptable when it is theoretically possible to prevent all cases of invasive cervical cancer through early detection and effective treatments (as suggested by Health Canada). Because of

the slow progression of cervical cancer, it has been suggested that even a 10 year screening interval would decrease the incidence of invasive cervical cancer by approximately two-thirds (Canadian Task Force on the Periodic Health Exam, 1994), highlighting the important role that regular screening has in potentially eliminating invasive cervical cancer in the population.

For women living in Prince George and its surrounding areas, mortality and morbidity rates due to cancer are significantly higher than provincial averages. For instance, when comparing provincial health regions, the Northern Interior Health Region (Prince George and its surrounding area, see Appendix A: British Columbia Health Regions) has the third highest Age Standardized Mortality Ratio for deaths due to breast cancer (BC Vital Statistics, 1996). This pattern is not specific to cancers alone; in fact, high cancer mortality ratios are a reflection of the general pattern of poor health among people living in this region. The Northern Interior Health Region has the lowest life expectancy and the highest infant mortality rates in the province (BC Provincial Health Officer, 1996).

Poor health in this region can be partly explained by social and economic characteristics. Compared to other regions in the province, the Northern Interior Health Region has higher unemployment rates, a higher proportion of the population on income assistance, and a higher proportion of the population with less than a high school education (Provincial Health Officer, 1996). When compared to other regions of the province, the Northern Interior Health Region ranks very poorly in socio-economic standing, with only the Cariboo region exhibiting a worse standing (Provincial Health Officer, 1996). It is likely that these poor socio-economic conditions are linked to the general pattern of poor health and higher cancer morbidity and mortality rates displayed by people living in this region.

The large proportion of aboriginal people living in Prince George and its surrounding areas gives further insight into explaining relatively high morbidity and mortality. It is estimated that 17% of the population in the Prince George region is aboriginal; this compares to a BC

provincial average of 5.2% (Social Program Renewal Secretariat BC, 1995). It is well established that aboriginal populations in Canada suffer a higher burden of ill health compared to non-aboriginal populations (Health Canada, 1995; Social Program Renewal Secretariat BC, 1995; Young, 1994). For example, aboriginal peoples have a life expectancy anywhere from 6 to 10 years less than that of other Canadians (Health Canada, 1995). This reflects a high infant mortality rate, and high mortality rates among adolescents and young adults. Although deaths among First Nations populations often result from high rates of accidents and injuries, First Nations people also suffer higher mortality due to cancers compared to other British Columbians. Although it is beyond the scope of this thesis to examine breast and cervical cancer rates among aboriginal women, a discussion of aboriginal health is an important part of any discussion of patterns of health in Prince George, especially considering the large proportions of First Nations people in this area.

Participation in Screening Mammography and Pap Tests in British Columbia

Clearly, people living in this region of the province suffer poor health when compared to others. From this, one can understand how it is that women in this region display higher cancer mortality rates. Yet, despite the substantial threat of cancer and the well-established screening infrastructure, the 1996 Provincial Health Officer reports low utilization of cancer screening services in the Northern Interior Health Region and the province.

The 1996 Provincial Health Officer's Report indicates 37% of women in the Northern Interior Health Region aged 50 to 69 have ever had a mammogram (Provincial Health Officer, 1996). This is far below the target set by the Screening Mammography Program of BC that 70% of women in this age group be screened annually. However participation in this region is higher than the provincial average, which indicates 25% of women between the ages of 50 and 69 have ever had a mammogram. Higher participation in this region might be a result of the permanent mammography screening facility in Prince George. Sixty-seven percent of women living in the

Northern Interior Health Region live in Prince George (BC Vital Statistics, 1996); thereby, the screening clinic is geographically accessible to the majority of women in the region. Many other regions of the province may be less urbanized implying that access to screening clinics could be more difficult.

The 1996 Provincial Health Officer reported similar patterns of low participation in cervical cancer screening. Eighty-five percent of women age 20 and over in British Columbia have *ever* had a Pap test (Provincial Health Officer, 1996). This suggests a significant portion of women in the population (e.g. 15%) have *never* been screened for cervical cancer. Unfortunately, as far as can be ascertained, statistics regarding participation in Pap test screening for the Northern Interior Health Region are not available.

Social Determinants of Health: Theories of Low Participation

Given the well-established screening programs in British Columbia, it is surprising to learn of low participation rates. Certainly, the reasons why women do or do not participate in preventive screening practices are complex. A number of models have been developed within the literature in efforts to explain why people engage in practices that promote health. Two of these models will be briefly discussed here: 1) the Health Promotion Model (Pender, 1987), and 2) the Socio-Environmental Model (Labonte, no date).

Both the Health Promotion Model and the Socio-Environmental Model explicitly recognize the role that social factors play in determining health; or, in the context of this thesis, the role that social factors play in determining participation in health services and consequently health. The Health Promotion Model is primarily a behavioral model aimed at explaining how health is determined at a psychological level for individuals. In contrast, the Socio-Environmental Model is a sociological model attempting to explain how health is determined at a societal level for groups of people. Both models are rooted in the concepts of health promotion.

Health Promotion

Health promotion ideas evolved internationally during the 1970's and 80's. At the time, the concept of health promotion represented a revolutionary shift in our understanding of health: no longer was health defined as simply the absence of disease. Social, economic, psychological, environmental and cultural determinants were identified as vital components of a new, expanded concept of health. Implicit in these new ideas was a recognition that many causes for ill health lay outside the control of the individual.

Health promotion has had a long history in Canada; in fact Canadian thinking stimulated much of the international development in health promotion ideas. Influenced by the Canadian governments 1974 Lalonde Report, the World Health Organization produced a series of philosophical reports about health and its new, complex definitions. These ideas culminated in a monumental document redefining health within a framework of health promotion concepts. Health was defined as "the extent to which an individual or group is able, on the one hand, to realize aspirations and satisfy needs, and on the other hand, to change or cope with the environment." (World Health Organization, 1984) Following this, the World Health Organization went on to release the 1986 Ottawa Charter on Health Promotion. The Charter was considered the international counterpart to the Canadian Epp Report, written by the federal Minister of Health Jake Epp. Using the new, expanded definition of health, The Ottawa Charter suggested a framework through which health promotion ideas could be implemented into policy and practice; in effect, creating a plan for action.

The Health Promotion Model

The Health Promotion Model (Pender, 1987) clearly reflects health promotion ideas and practices. Using the World Health Organization's holistic definition of health, the Health Promotion Model illustrates the complex mechanisms through which social determinants can influence an individual's health. Derived from social learning theory, the model suggests that

health behavior is regulated by cognitive mediating processes which are in turn modified by factors such as age, race, income, and education, among others (Pender, 1987). The model consists of 13 factors determining health-promoting behavior. Each of these is classified as one of the following:

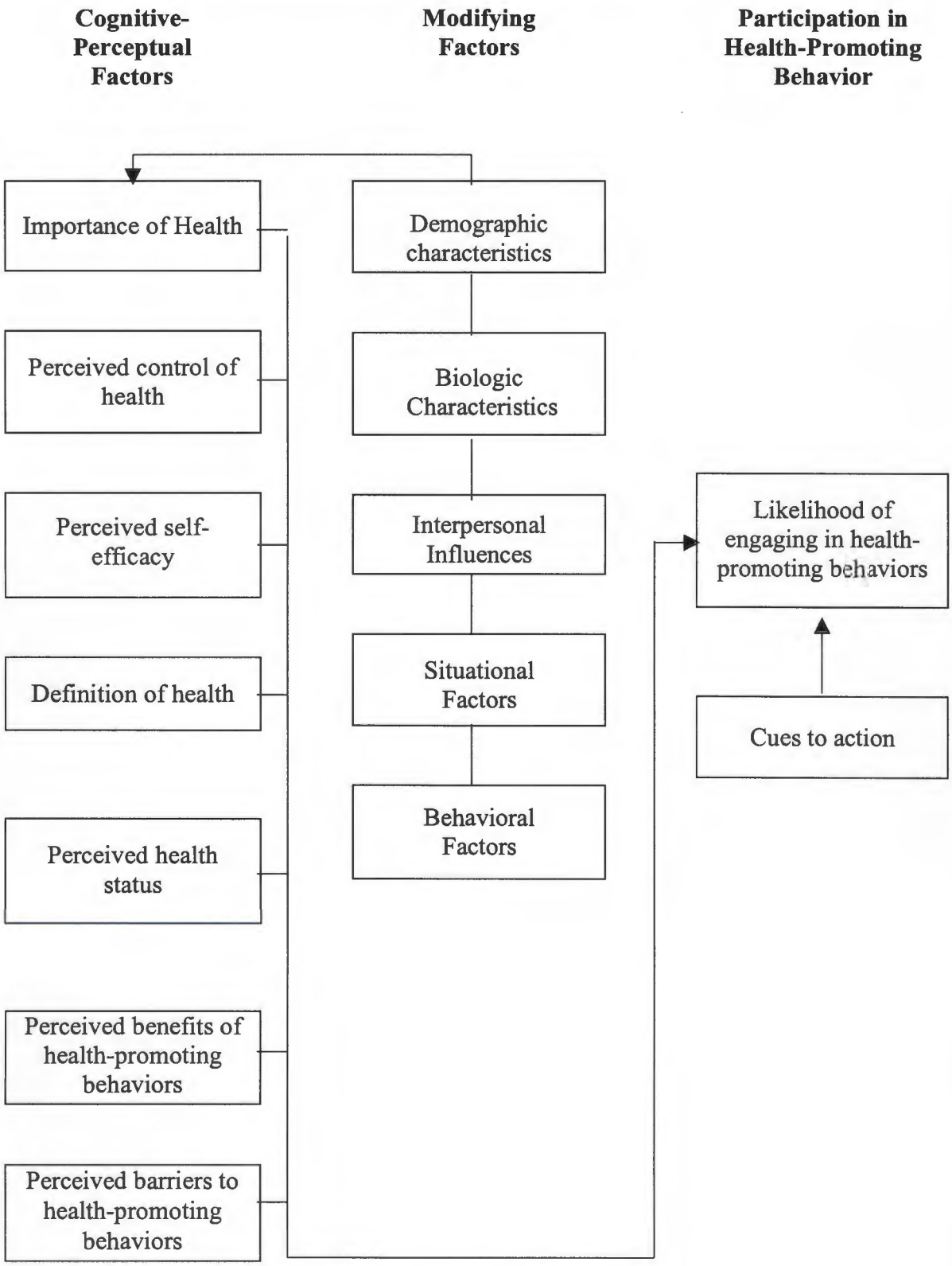
1) Cognitive-Perceptual Factors - factors that exert direct influence on the likelihood of engaging in health-promoting behavior;

2) Modifying Factors - factors that influence Cognitive-Perceptual factors, thereby indirectly influencing health-promoting behavior;

3) Cues to Action - internal or external cues that increase or decrease the likelihood of taking health-promoting action (Pender, 1987).

The relationship between these factors is illustrated in Figure 1.1.

Figure 1.1: Pender's Health Promotion Model (Pender, 1987, p.58)



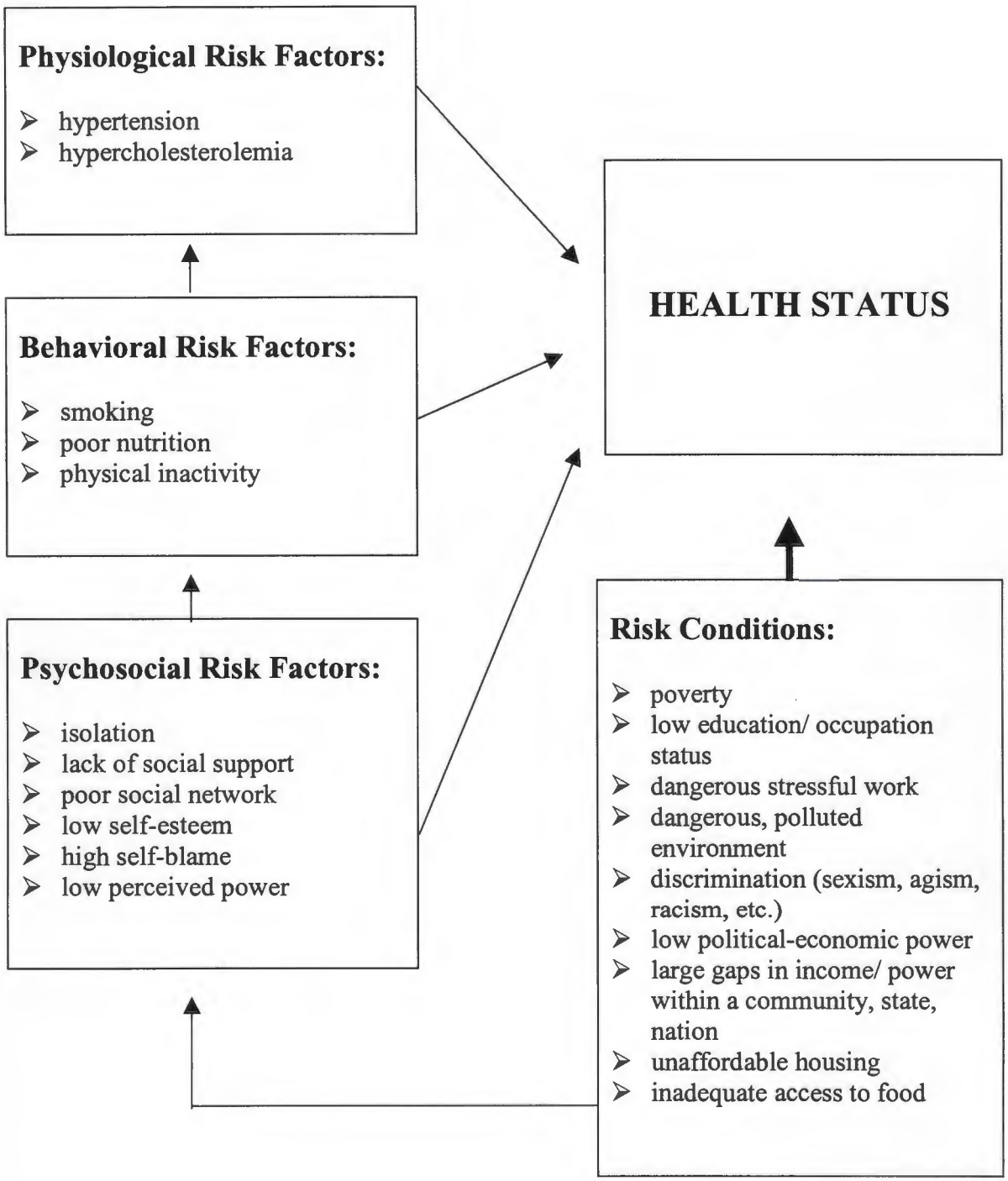
The relevant part of this model, with respect to this thesis, is the box termed 'Demographic Characteristics'. Pender's model helps to illustrate how social factors such as age, sex, race, education and income (e.g., demographic characteristics) act to influence Cognitive-Perceptual Factors which, in turn, determine an individuals likelihood of engaging in health-promoting behavior. In this sense, one can understand how an individual's social class can influence how that individual perceives their own health, the importance of their own health, their ability to control their own health, and so forth. In other words, Pender helps to explain the mechanisms by which social factors determine health behaviors and, consequently, health outcomes.

The Socio-Environmental Model

The second model that provides a framework for this thesis is the Socio-Environmental Model (Labonte, n.d.). The Socio-Environmental Model was designed, according to its author, to illustrate how social inequities impact health outcomes. The model serves to organize complex information into a manner that allows some understanding of how social factors are associated with health.

The following Figure 1.2 is a diagrammatical representation of the Socio-Environmental model.

Figure 1.2: The Socio-Environmental Model (Labonte, n.d., p. 11)



The Socio-Environmental Model suggests that social Risk Conditions can influence health in either a direct manner or an indirect manner. In describing how social risk conditions can have a *direct* association with health, the author explains:

> People who experience relative powerlessness as measured by lower socioeconomic status indicators (income, education, occupation) are more likely to experience morbidity and premature mortality; and are more likely to work in dangerous, stressful jobs and to live in polluted neighbourhoods. (Labonte, n.d, p. 10)

The *indirect* association of social Risk Conditions on health status is somewhat more complicated. The author explains how risk conditions such as poverty and discrimination can contribute to Psychosocial Risk Factors, Behavioral Risk Factors, Physiological Risk Factors and, ultimately health status. He explains this as follows:

> People living in high risk conditions are more likely to experience less social support and fewer social networks, to have low self-esteem, be unhappy and experience self-blame and low perceived power. This increases physiological functioning associated with increased heart and other diseases, i.e. hypertension, hypercholesterolemia and release of stress hormones. Lack of social support poses a significant independent health risk. The presence of physiological risk factors, diagnosed disease or subjective illness may also compromise a person's ability to maintain social networks and support. (Labonte, n.d., p.12)

For the context of this thesis, the Socio-Environmental Model illustrates how social Risk Conditions can influence Behavioral Risk factors such as smoking, poor nutrition, and physical inactivity. Clearly, non-participation in health promoting activities, such as mammography and Pap tests can also be classified as Behavioral Risk Factors. In the context of the Socio-Environmental Model, one can see how social Risk Conditions can be associated with non-health-promoting behavior.

At this point, it is important to clarify that this study is not aimed at examining the *mechanisms* through which social factors determine health outcomes. This study is simply intended to determine if there is an association between social factors and previous participation in health services and, in theory, health outcomes. The purpose of including Pender's Health

Promotion Model and Labonte's Socio-Environmental model is to suggest possible ways in which this association might take place. Central to the discussion of the findings of this thesis will be health promotion ideas such as those illustrated by Pender and Labonte.

Objectives

Inequities in the health of populations represent a substantial problem. In Prince George, a community with a comparatively poor socio-economic standing and a higher risk for poor health, any step toward alleviating inequities in health is invaluable. This thesis attempts a move in this direction by identifying groups in the population with low participation in cancer screening programs.

Specifically, the objective of this thesis is two-fold:

1. for all women, to determine if selected social factors (age, income, education, marital status, employment status, immigrant status, and disability) are associated with having ***ever*** participated in previous mammography/Pap test.
2. for those women who have had previous mammography/Pap tests, to determine if these social factors are associated with the ***recency*** of the previous mammography/Pap test.

Note that further discussions in this thesis regarding previous mammography and Pap test use will reflect this division between having *ever* been screened and the *recency* of last screening. Having *ever* been screened refers to having ever versus never received a previous Pap test or mammogram. The examination of having ever been screened includes all women in the sample. The *recency* of screening refers to the time at which the most recent screening occurred; clearly this sample only includes those women who have received previous screening.

CHAPTER TWO: LITERATURE REVIEW

Overview

The literature concerning utilization of screening mammography and Pap tests is extensive and complex. There are many factors influencing why some women participate in screening services regularly and others do not. This literature can be grouped under two themes: 1) psychological determinants of screening utilization, and 2) social determinants of screening utilization. Research addressing psychological determinants is concerned with explaining screening behaviors by examining factors such as fear, pain, embarrassment, and anxiety. In comparison, research addressing social determinants is concerned with identifying the characteristics of women in the population with low participation rates by examining demographic factors such as age, education, income, and ethnicity.

This classification of the literature is by no means rigid; in fact, the complexity of screening utilization is sometimes best explained by interactions between social and psychological determinants. Since this thesis focuses on the social determinants of participation in preventive screening, an exploration of psychological determinants is beyond the scope of this study. The research reviewed in this chapter will address only social determinants of mammography and Pap test use. This reflects the primary mandate of this study; that is, to determine if an association exists between social factors and previous participation in Pap test and/or mammography services in Prince George.

The literature discussed in this chapter is organized by region: research conducted in British Columbia will be discussed first, followed by Canadian research and then research from the United States. This organization scheme is used simply to aid in the presentation of the extensive amount of literature.

This chapter uses the term 'social determinants' in a more narrowly defined manner than that used in the previous chapter. Social determinants herein refer to the influences of

quantifiable social factors such as income, education level, marital status, employment status, and so forth. This definition better reflects the manner in which the term 'social determinants' is examined in the following literature.

Research in British Columbia

Research into factors influencing Pap and mammography utilization in British Columbia is plentiful in comparison with other provinces. Interest in researching screening participation in BC might be a result of the progressive role the province has taken in establishing screening programs.

In terms of mammography utilization, there are two articles of relevance: 1) Kan, Hislop and Skippen (1991) and 2) Johnson, Hislop, Kan, Coldman and Lai (1996). Both studies were conducted jointly by the Screening Mammography Program of BC (SMPBC) and the BC Cancer Agency with the purposes of identifying factors associated with the *re-screening* of women in the SMPBC. Re-screening refers to women returning for subsequent screening within two years after initial screening. These studies were aimed at identifying factors associated with compliance in the screening program in order to optimize the program efficiency; thus factors determining participation in initial screening were not examined. Both studies used a self-administered questionnaire to collect data.

The first study (Kan, Hislop, & Skippen, 1991) was conducted in the early years of the SMPBC (1988-1990). The primary purpose was to assess the proportion of women who had returned for annual screening mammography and to investigate the reasons for not returning. Women reported the main barrier for re-screening to be the distance to screening clinics. In terms of socio-economic barriers, the study revealed no effect of education, marital status, and ethnic origin (for this study, ethnic origin referred to Caucasian, Japanese/Chinese, or Other). In fact, the only characteristic identified as being consistently descriptive of 'returners' to the SMPBC was age: those returning tended to be older than non-returners. Data analyses for this

study consisted of descriptive statistics, therefore since a statistical test was not used, it was difficult to determine if there were truly differences between groups (i.e., if the apparent differences were 'real' or a result of chance).

The more recent study (Johnson, Hislop, Kan, Coldman, & Lai, 1996) used logistic regression analysis and was able to determine factors that were statistically associated with re-screening. None of the social factors examined in this study (age, ethnicity, marital status, and education) were significant in differentiating those who returned for screening and those who did not.

An important element in the preceding two studies was that both samples consisted of women being examined for *re-screening*. This suggests these samples may have constituted a somewhat homogenous group in terms of motivation to participate, cancer and prevention knowledge, geographic accessibility, and socio-economic status. The fact that these women accessed mammography services previous to the study suggests they may have come from backgrounds that were conducive to accessing health services, as discussed in Chapter One. Given this, it is understandable that social factors were not significant in predicting mammography use.

Published research into social determinants of Pap test use in BC has been concerned with First Nations women only. This is because of very high mortality rates due to cervical cancer among First Nations women and the low participation rates in Pap test services. Although this thesis can not examine participation of First Nations women in Prince George (due to data restrictions), First Nations women undoubtedly make up a significant portion of the women included in this thesis (since the data for this thesis is a population representative sample, approximately 17% of the thesis sample could be of First Nations ancestry according to the population proportions in this region). For this reason, the studies concerning First Nations women and their participation in Pap test programs in BC are relevant to this thesis.

Examinations of First Nations women and their participation rates give insight into how social determinants influence screening practices. In 1992, Deschamps and colleagues used a qualitative methodology to explore the reasons for under-participation of First Nations women in the BC Cervical Cytology Screening Program (Deschamps, Band, Hislop, Clarke, Smith, Ng, & Math, 1992). The primary reasons for non-participation were found to be 1) a lack of knowledge about Pap tests and its importance, 2) feelings of embarrassment and shame, and 3) a lack of continuity of care due to high physician turnover rates in aboriginal communities. More recently, Clarke and colleagues conducted a further examination of factors associated with non-participation in Pap test screening among First Nations women (Clarke, Joseph, Deschamps, Hislop, Band & Atleo, 1998). Also using a qualitative methodology, this group of researchers identified three themes. First, similar to Deschamps and colleagues (1992), they found little knowledge about and preparation for Pap tests among First Nations women; consequently women were embarrassed and intimidated by the procedure. Second, First Nations women felt inhibited to participate in Pap tests because of insensitivity among health care workers or a lack of clinics that were 'inviting' to First Nations people. Third, First Nations women were more likely to practice health promotion through contact with friends and family and not through the health care system, meaning health promotion practices such as Pap tests were often left out of the health practices of First Nations women. Furthermore, for First Nations women, health promotion was about maintaining health and focusing on positive approaches to health care that provided personal control in making choices. Women felt a preventive practice such as a Pap test had a negative health focus and therefore did not fit into their health maintenance practices (Clarke et al., 1998).

Both of these studies illustrate the complex ways in which social determinants can influence a woman's participation in Pap tests. Like First Nations women, it is possible that women from other marginalized groups experience similar barriers to screening services.

Despite a comparatively large amount of research concerning the social determinants of Pap test and mammography utilization in British Columbia, gaps remain in the information available. For instance, although some aspects of the social determinants of mammography utilization have been examined, there seems to be no data concerning the effects of income, work status or disability. Furthermore, mammography research in BC has examined determinants of *re-screening* only. It is possible that an examination of the social determinants of having *ever* been screened may reveal different results, as re-screened samples may not be representative of the general population.

Finally, although research regarding Pap test utilization by First Nations women has been revealing, there has been no published research concerning the social determinants of Pap test utilization in other populations of women in British Columbia. An examination of other Canadian research in this field provides some insight into this missing information.

Research in Canada

A number of Canadian studies have identified an association between social determinants and participation in preventive screening. The most relevant of these studies is a recent examination of the preventive health practices component of the 1994 National Population Health Survey (NPHS) (Snider, Beauvais, Levy, Villenueve, & Pennock, 1996). This study is of particular relevance to this thesis since a portion of the NPHS data is used as the database for this thesis. Snider and colleagues examined national participation rates in both Pap test and mammography services, and the association of these participation rates with education, income, and age. A number of significant associations were found.

In terms of mammography utilization, the proportion of women who had *never* had a mammogram was found to be highest among women with the lowest educational attainment. Similarly, in terms of Pap test utilization, a large proportion of women with lower education and income had *never* had a Pap test. An additional pattern of age was reported for *recency* of the

last Pap test where large proportions of older women reported their last Pap test to be longer than three years ago. The analysis used in Snider and colleagues' (1996) study was purely descriptive. Consequently, the findings regarding the relationship between social factors and preventive screening participation could not be interpreted in terms of their statistical significance.

Other Canadian studies have revealed similar relationships between social factors and mammography and Pap test use. The following section will address, first, social determinants of mammography use, and second, social determinants of Pap test use in the Canadian context.

Social Determinants of Mammography Use in Canada

Katz and Hofer (1994) used the 1990 Ontario Health Survey and logistic regression modeling to determine the association of income and education with having *ever* had a mammogram in Ontario. They found both higher income and higher education to be predictive of increased mammography use. In fact, compared to women from the lowest income bracket, women from the highest income bracket were 1.8 times more likely to have ever had a mammogram. Also, women with a college education were 1.5 times more likely to have ever had a mammogram than women with less than a high school education.

Potvin, Camirand, and Beland (1995) used a 'health care utilization model' to determine those factors associated with having *ever* had a mammogram. The 'health care utilization model' consisted of a large number of psychological, socio-economic and biological factors organized into a fashion that "attempts to integrate both women's characteristics and their relationships with the health care system into a single prediction model." (Potvin, Camirand, & Beland, 1995, p.516) Data were taken from the 1987 Quebec Health Survey and analyzed using a complicated polychotomous logistic regression strategy. Of the four socio-economic factors included in the regression equation (i.e., age, education, marital status, and work status), education and work status proved to be significant predictors. Specifically, compared to women with less than a high

school education, women with a college education were 1.6 times more likely to have *ever* had a mammogram. Additionally, women working outside the home were 1.3 times more likely to have ever had a mammogram than women working at home.

Beaulieu, Beland, Roy, Falardeau, and Hebert (1996) examined the factors determining attendance for mammography *re-screening* at a clinic in Montreal. Similar to the Potvin, Camirand, and Beland (1995) study, Beaulieu and colleagues examined a large number of factors including psychological, socio-economic and biological risk factors. Stepwise logistic regression was used to reveal that none of the socio-economic variables (i.e., income, education, and marital status) were significantly associated with re-attendance to the clinic. It is important to note that this study examined *re-screening* of women for mammography. As was the case with the previously discussed research in BC, it is possible that there was no effect of social factors because participants in the study may have been similar in terms of socio-economic status, and therefore not representative of the general population.

Woloshin, Schwartz, Katz, and Welch (1997) conducted the most recently published examination of social influences on Canadian women's participation in mammography services. This study used data from the 1990 Ontario Health Survey to determine the effect of language on having *ever* had a mammogram. Languages examined in the study included English, French, Chinese, Greek and Portuguese, among others. All other socio-economic factors were covaried (i.e., age, education, and income). Multiple logistic regression was used to reveal a pattern where Chinese-speaking women and French-speaking women were found to have a lower odds of receiving a mammogram when compared to English speaking women. Other languages were not associated with having ever had a mammogram. Although language cannot be used as a direct proxy for immigrant status, these results suggest the possibility that immigrant women are participating in mammography to a lesser extent than Canadian-born women.

In sum, income, education, work status, marital status, and immigrant status have all been examined in relation to previous mammography use in the Canadian context. It is clear that a number of these play significant roles in determining participation in mammography services. Yet to date, there has been no examination of all of these social factors in one study. For the most part, social determinants of mammography use are examined within the context of other possible determinants such as psychological, lifestyle and/or biological factors. This is likely due to the fact that psychological, biological and/or lifestyle determinants have been found to explain more of the variation in mammography participation than social determinants (Beaulieu, Beland, Roy, Falardeau, & Hebert, 1996); thus social determinants have traditionally been examined to a lesser extent. Finally, there seems to be no research examining the effect of disability on a woman's participation in mammography screening in Canada.

Social Determinants of Pap Test Use in Canada

Goel (1994) used the 1990 Ontario Health Survey to determine the socio-economic, health care, and lifestyle factors associated with Pap test screening in Ontario. For this study, socio-economic variables included age, marital status, immigrant status, work status, education, and income. Multiple logistic regression was used to predict the determinants of 1) having *ever* had a Pap test and, 2) for those having received previous Pap tests, the *recency* of the last Pap test. Results revealed that the social determinants of each aspect of Pap test participation were different.

In terms of having *ever* had a Pap test, immigrant status, education, and work status were significant predictors. For example, women with a complete high school education were 2.3 times more likely to have ever had a Pap test than women with less than a high school education. Further, compared to Canadian born women, recently immigrated women (<10 years) were significantly less likely to have ever had a Pap test (Odds Ratio [OR] 0.20). Women working in the home and women over the age of 65 were also significantly less likely to have

ever had a Pap test. Income and age were not significant predictors of having ever had a Pap test.

For those women having received previous Pap tests, younger women were significantly more likely to have received a *recent* Pap test, when compared to older women. Also, single, divorced, or widowed women were less likely to have received a recent Pap test compared to married women. Income, education, immigrant status, and work status were not significant in predicting recency of previous screening.

Katz and Hofer (1994) found an association of income and education with having *ever* had a Pap test among women in Ontario. Their analysis revealed similar results to those found with their examination of mammography utilization; that is, women with higher incomes and higher education were significantly more likely to have ever received a Pap test.

Finally, Woloshin, Schwartz, Katz and Welch (1997), in examining the association of language and Pap test use, revealed similar patterns to those found with mammography use. Again, when compared to English-speaking women, Chinese-speaking women were significantly less likely to have *ever* received a Pap test. However, in a more general sense, the analysis revealed that, compared to Canadian-born women, recent immigrants (<5 years) of any background were less likely to have ever had a Pap test.

In sum, the research concerning social influences of Pap test utilization in Canada has illustrated a number of patterns. Age, immigrant status, work status, marital status and education have been found to exert some influence in determining participation in Pap test services. As was the case with mammography research, however, there has been no examination of the effects of disability on Pap test utilization.

Research in the United States

The largest portion of literature concerning mammography and Pap test utilization comes from the United States (US). Literature from the US illustrates similar trends to those

identified in Canada: women from socially advantaged groups participate in mammography and Pap test screening in larger numbers than women from disadvantaged groups. Because of the large number of studies available from the US, the first part of this section will discuss general trends for the sake of simplicity. This will be followed by a discussion of specific studies of relevance, since these studies fill some of the gaps left by Canadian research.

In general, American women display higher rates of participation in mammography screening than Canadian women (Katz & Hofer, 1994). In fact participation in mammography is two to three times higher in the US (Katz & Hofer, 1994). Still, social disparities remain; women from higher income brackets, women with more education, and younger women are generally more likely to have *ever* had a mammogram (Calle, Flanders, Thun, & Martin, 1993; Kreher, Hickner, Ruffin, & Lin, 1995; Mootz, Glazer-Waldman, Evans, Peters, & Kirk, 1991). Participation in Pap tests in the US is similar to participation in Canada (Katz & Hofer, 1994). Also, similar social disparities in participation rates are found among American women as among Canadian women. Women who are younger, less educated, and not married are significantly more likely to have *never* had a Pap test (Calle, Flanders, Thun, & Martin, 1993; Ives, Lave, Traven, Schulz & Kuller, 1996).

As in Canada, it is common for US screening utilization studies to use quantitative methodologies. Logistic regression is a standard approach to data analysis and, quite often, this analysis is conducted on data obtained from large national surveys.

A study of particular interest for the context of this thesis examined the effect of disability on Pap test and mammography use (Ives, Lave, Traven, Schulz & Kuller, 1996). Disability (defined by Ives et al. as 'needing assistance with daily activities') proved to be a significant predictor of decreased mammography and Pap test use (OR 0.56). This is an important element to include here since, as far as can be ascertained, there has been no previous examination of the effect of disability on participation in screening programs.

There are areas of difference when comparing Canadian studies to US studies. For instance, in Canada measures of ethnicity comprise a large number of possible ethnic backgrounds, reflecting the multi-cultural nature of Canadian society. The US, while also highly multi-cultural, frequently uses measures of ethnicity that are defined in terms of dichotomy, as either 'black' (i.e., African-American) or 'white' (i.e., Caucasian). As far as can be assessed from the current US literature, there have been few studies examining racial groups other than African-Americans and, to a lesser extent, Hispanic-Americans.

Furthermore, the effect of income on participation in screening programs in the US has been a carefully researched phenomenon, primarily because the health care system in the US is funded through private insurance schemes. Because there is no universal health insurance in the US (as there is in Canada), researchers are interested to see whether women with no insurance participate in Pap tests and screening mammography to a lesser extent than women with insurance. Indeed, income tends to have a large effect on women's participation in health services in the US, more so than it does in Canada (Katz & Hofer, 1994). Research has identified that the odds of having *ever* received mammography screening in the US are 3.5 times greater for women with higher incomes than women with lower incomes (Calle, Flanders, Thun, & Martin, 1993). This odds ratio is twice the ratio reported among Canadian women (OR 1.8) (Katz & Hofer, 1994).

Despite some differences between American and Canadian research, literature from the US remains useful in providing insight into possible effects of social determinants on Pap test and mammography use in Canada. As was illustrated in Canadian research, participation in screening services in the US is partly dictated by social background.

Summary

A number of patterns have emerged from this literature review. Most importantly, social determinants seem to be influential in determining participation in Pap tests and screening

mammography. The literature reported in this chapter has identified a list of significant social determinants: age, income, education, work status, immigrant status, marital status, and disability.

In addition, the literature has illustrated that the social determinants of Pap test use are not necessarily the same determinants of mammography use. For instance, marital status seemed to be consistently associated with Pap test use, but was not statistically significant in predicting mammography use. Furthermore, in terms of methodological approaches, it is quite common for research in this field to be a secondary analysis of a large population-based survey. Multiple logistic regression is used almost universally to predict *ever* versus *never* having had previous screening.

This thesis follows the existing literature in a number of ways. First, each of the possible social determinants of preventive screening discussed in this chapter is examined using logistic regression analyses to determine significant associations. Second, this thesis uses existing data from a large national survey. Secondary analysis of existing data is a practical approach to research simply because it requires little further input of resources, yet it can produce valuable results.

Examining social determinants of health services utilization is especially relevant to northern regions where the population tends to be less healthy. This thesis will add to the existing knowledge regarding utilization of preventive screening services by examining Pap test and mammography utilization in northern British Columbia. Further, examinations into the social determinants of participation in preventive screening services in British Columbia are incomplete. Although social determinants of mammography *re-screening* have been examined, social determinants of having *ever* been screened have not. It is possible that the findings regarding having *ever* been screened will be different than findings regarding *re-screening,*

since ever screened samples have more variation in terms of socio-economic status compared to re-screened samples.

Finally, studies examining social determinants of Pap test use in the general population are non-existent in British Columbia. It has been established that First Nations women have low participation rates; yet, it may also be possible to identify other groups of women that exhibit low participation in Pap test screening.

CHAPTER THREE: METHODS

As previously mentioned, the methodology used in this thesis follows from previous research in this field. This methodology is outlined in the following sections: (1) Source of Data, (2) Sample, 3) Variables, and 4) Data Analysis.

Source of Data

The data for this thesis come from the 1994 National Population Health Survey (Statistics Canada, 1994). The National Population Health Survey (NPHS) was a large national survey collecting information on a variety of Canadian health issues, including mammography and Pap test utilization. Nation-wide, the NPHS surveyed 26,430 households with a minimum of 1200 households from each province.

Provinces had the opportunity to increase their sample size by purchasing the option to include additional respondents. In British Columbia, additional respondents were included in the sample taken from Prince George, resulting in an augmented sample size of 838 for this community. Consequently, the NPHS is a particularly beneficial database for use in this thesis. This unusually large sample size for a community the size of Prince George allows for a statistical analysis of the social factors determining women's use of mammography and Pap test services.

Data for the NPHS was collected using telephone interviews. Participants were selected using random digit dialing techniques, consequently, the women in this data set are a population representative sample of women in Prince George. Furthermore, a detailed follow-up strategy allowed for a survey response rate of 88.7%.

Sample

The original Prince George NPHS sample was rearranged to form two data sets: 1) a mammography sample and 2) a Pap test sample. Women were included in the mammography sample if they were between the ages of 40 and 79 years. These ages are in accordance with the

Screening Mammography Program of British Columbia guidelines which stipulate women should receive mammography screening every two years after the age of 40 until the age of 79 (personal communication, S. Otteson, August 20th, 1998). The mammography sample consisted of 186 women whose average age was 50 years.

Similarly, women were included in the Pap test sample if they were between the ages of 18 and 69 years. This is in accordance with the Canadian Guide to Clinical Preventive Health (1994) which recommends screening for cervical cancer begin annually at age 18 or following initiation of sexual activity; after two normal smears, screening should proceed every three years until age 69. The Pap test sample consisted of 418 women whose average age was 35 years. Note that Canadian Guide to Clinical Preventive Health guidelines were used instead of BC Cervical Cytology guidelines (which recommends screening every 2 years after 3 normal smears) because the NPHS allows data to be divided into 1, 3, or 5 year increments only. Therefore, the NPHS did not allow the data to be grouped using BC Cervical Cytology guidelines.

Variables

Outcome variables are derived from the Preventive Health Practices component of the NPHS. Women aged 35 and older were asked if they had *ever* had a mammogram and the *recency* of their latest mammogram. Similarly, women aged 18 and older were asked if they had *ever* had a Pap test and the *recency* of their latest Pap test (see Appendix B: NPHS Questionnaire). These original mammography and Pap test variables were used to create a single variable describing each.

The mammography utilization variable was created by combining the variables for 'ever had a mammogram' and 'recency of the latest mammogram' to produce a new variable that described both if and when a mammogram was received. This variable was collapsed into 4 categories:

1) Ever received a mammogram

a) received a mammogram in the previous 2 years (hereafter *'recent'* mammogram)

b) received a mammogram longer than 2 years ago (hereafter *'non-recent'* mammogram)

2) Never received a mammogram

These categories reflect the recommendations of the Screening Mammography Program of BC, as discussed previously.

Similarly, combining the variables for 'ever had a Pap test' and 'recency of latest Pap test' created the Pap test utilization variable. This variable was also collapsed into 4 categories:

1) Ever had a Pap test

a) received a Pap test in the previous three years (hereafter *'recent'* Pap test)

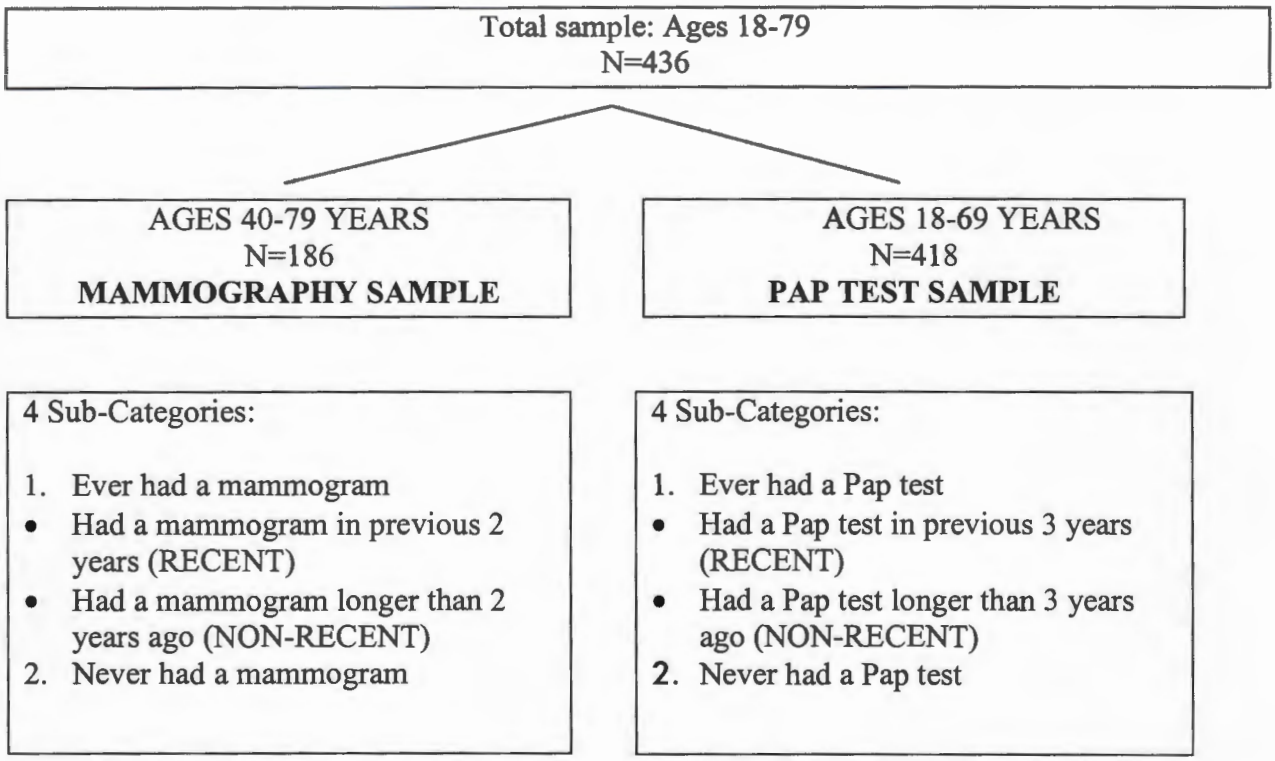
b) received a Pap test longer than three years ago (hereafter *'non-recent'* Pap test)

2) Never had a Pap test

These categories reflect the recommendations of the Canadian Guide to Clinical Preventive Health (1994) discussed previously.

Rearrangement of the original sample and the creation of outcome variables (including the subsequent sample sizes) are described in Figure 3.1.

Figure 3.1: Rearrangement of original sample



Seven social factors were examined as potential predictors of mammography and Pap test utilization. These were age, income, education, immigrant status, disability (defined in the NPHS as a long-term restriction of activity), marital status, and employment status. The selection of these predictors follows from previous research and is representative of predictors examined in the literature review.

It should be noted that the age variable was included primarily as a control variable so that the impact of the other social determinants on participation practices could be assessed over and above the effect of age. Clearly, age was considered a control variable because, as women age, their chances of having previously participated in cancer screening increases. Having said this, however, age can also be considered a social determinant in the same sense that the other variables are considered social determinants. When remembering the definitions offered for 'social determinants' (Chapter One) one can understand how an individual's age functions to determine his or her social 'status' and, in turn, create social disparities that serve to influence health. Therefore, in this thesis, the age variable has a dual function: to act as a covariate and a social factor.

Four of the seven social variables were taken directly from the NPHS database without any alterations: income, immigrant status, disability, and employment status. The remaining 3 predictors required alteration. The original NPHS variables for age and education contained many categories (i.e., 10 age categories and 11 education categories). These variables were collapsed into more manageable sizes in order to prevent problems in the subsequent logistic regression analysis. Specifically, problems can occur in logistic regression when small sample sizes (such as N=186 in the mammography sample, see Figure 3.1) are combined with discrete variables containing many categories. This results in too many cells with no cases, which may result in inaccurate parameter estimates (Tabachnick & Fidell, 1996).

Furthermore, the original NPHS variable for marital status contained 3 categories: 1) married/common law; 2) single; 3) other (separated, divorced, and widowed). This variable was collapsed into 2 categories since, for the purposes of this study, the single and other categories suggest the same circumstance, that is, the absence of a live-in partner. A description of each predictor variable in its final format is found in Table 3.1.

Table 3.1: Final format of predictor variables

Predictor	**Categories**
AGE *(6 categories)*	18-29 years 30-39 years 40-49 years 50-59 years 60-69 years 70-79 years
INCOME *(5 categories)*	Lowest (<$10 000) Low-middle ($10 000-14 999) Middle ($15 000-29 999) Upper-middle ($30 000-59 999) Highest (>$60 000)
EDUCATION *(3 categories)*	Less than high school High school More than high school
IMMIGRANT STATUS *(2 categories)*	Yes No
DISABILITY *(2 categories)*	Yes No
MARITAL STATUS *(2 categories)*	Yes No
EMPLOYMENT STATUS *(3 categories)*	Currently working Not currently working but had a job Did not work in previous 12 mo.

Data Analysis

The primary analysis for this study consisted of modeling a series of logistic regression equations predicting mammography/Pap test utilization from the 7 social variables. As discussed earlier, logistic regression is used almost universally in mammography and Pap test utilization research. It is ideal for this sort of analysis for a number of reasons. Primarily, logistic regression requires discrete response variables, such as is presented in this study, that is, 'ever had a mammogram' versus 'never had a mammogram'. Secondarily, logistic regression produces Odds Ratios, which allow for ease in interpretation of results. Odds Ratios indicate an approximation of the relative risk of being in one outcome category when the value of the predictor increases by one (Tabachnick & Fidell, 1996). Lastly, logistic regression has relatively few restrictions regarding the nature of the data set. Variables do not need to be linearly related or normally distributed, which allows for relatively straightforward analysis.

Several data considerations were addressed before proceeding with the logistic regression analyses. These are 1) ratio of cases to variables 2) adequacy of expected frequencies 3) mulitcollinearity and 4) presence of outliers.

First, problems can occur in logistic regression when there are too few cases (i.e., small sample size) relative to the number of predictor variables. As mentioned previously, this can result in cells with no cases and consequently inaccurate parameter estimates (Tabachnick & Fidell, 1996). The wide parameter estimates (confidence intervals) listed in Table 4.7 of the following Results chapter shows there could be a problem with the ratio of cases to variables. However, since it was impossible to increase the sample size, this problem was accepted and analysis continued. Interpretation of the wide confidence intervals will be considered in light of the small sample size problem.

Second, since logistic regression has a Goodness of Fit component, it is important to ensure that expected cell frequencies are not small. Small expected frequencies could reduce the

power of the analysis to detect group differences. Tabachnick and Fidell (1996) suggest that "all two-way associations should be greater than one, and no more than 20% should be less than five" (p. 579). An examination of cross-tabulation tables revealed that all cell frequencies are greater than 1 and only a small portion (10%) are less than 5, therefore expected cell frequencies for this data meet the specified criteria.

Third, logistic regression can be sensitive to collinearity among predictors. Collinearity diagnostics using tolerance and variance inflation factors revealed multicollinearity was not a problem for this set of predictors. Last, an examination of residuals indicate that most cases fall within two standard deviations of the predicted model. It is safe to assume that outliers are not a problem with this data.

Separate regression equations were modeled using various combinations of the outcome variables. Comparing different combinations of outcomes allows for the production of a more detailed picture of mammography and Pap test use. The mammography and Pap test utilization variables each have 4 levels, which resulted in 8 models. These are outlined in Table 3.2.

Table 3.2: Summary of Models

Model	Dichotomous outcome variable
Mammography Models	
Model 1 N=186	NEVER had a mammogram vs. EVER had a mammogram (recent and non-recent)
Model 2 N=151	NEVER had a mammogram vs. had a RECENT mammogram
Model 3 N=97	NEVER had a mammogram vs. had a NON-RECENT mammogram
Model 4 N=118	had a NON-RECENT mammogram vs. had a RECENT mammogram
Pap Test Models	
Model 5 N=418	NEVER had a Pap test vs. EVER had a Pap test (recent and non-recent)
Model 6 N=318	NEVER had a Pap test vs. had a RECENT Pap test
Model 7 N=76	NEVER had a Pap test vs. had a NON-RECENT Pap test
Model 8 N=357	had a NON-RECENT Pap test vs. had RECENT Pap test

The analysis of each model consisted of one run of the multiple logistic regression with all of the predictors entered simultaneously. In this way the impact of all 7 predictor variables was evaluated together. This modeling strategy was chosen because interpreting the individual effects of predictor variables within the context of the other predictor variables allows for a more realistic representation of the true effect of each significant variable. In other words, a significant predictor can be thought of as having an effect on mammography/Pap test outcome that is over and above the effects of other predictors.

Since all predictor variables in these analyses are discrete, a contrast-coding matrix needed to be chosen in order to run the variables categorically. Indicator coding (the SPSS default) was chosen over other coding methods because the parameter results produced by indicator coding are easier to interpret. A definition and sample-coding matrix for indicator coding can be found in Appendix C.

The results of each of the eight logistic regressions were analyzed in two steps: 1) an assessment of overall model fit, followed by 2) an assessment of parameter significance. If the overall measure of fit, indicated by a Chi-square (χ^2), was not significant ($p>.05$), then it was concluded that the predictor variables as a group did not significantly predict mammography/Pap test utilization and analysis ceased. However, if the overall measure of fit (χ^2) was significant ($p<=.05$), then parameter significance was examined. Significant parameters, that is, main effects of predictor variables, were interpreted in terms of their contrast-coding matrix.

Interaction terms were examined with each of the six models. However, small sample sizes restricted the ability of the regression analyses to pick up differences in models that contained interaction terms, therefore interactions were excluded in the final analysis.

The main outcome measures for this study are as follows:

1) overall model fit was assessed using the χ^2 statistic and an effect size measure (pseudo-R^2). There are a number of options for measuring effect size in logistic regression (Menard, 1995). The pseudo-R^2 is an approximation of the ordinary least squares regression R^2 and indicates the approximate amount of variation in outcomes accounted for by the group of predictors. A more detailed description of the pseudo-R^2 value can be found in Menard (1995).

2) parameters were assessed using Odds Ratios.

In sum, this methodology is an effective approach to the type of research question addressed in this thesis. As outlined in the review of the literature, it is common for research about mammography and Pap test utilization to use large population-based surveys, such as the NPHS, as a data source. In addition, logistic regression is a common and straightforward statistical approach to questions about mammography and Pap test utilization since it produces results that are easily interpretable. The methodology used in this thesis departs slightly from previous approaches to mammography and Pap utilization in that a 'modeling' approach is taken. As in other studies, the predictor variables used in this thesis are assessed for their individual association with the outcome (this is represented in the Odds Ratio). Yet, in taking a 'modeling' approach, this thesis is also assessing the contribution of the predictor variables *as a group* in explaining participation in mammography and Pap test utilization (this is represented in the pseudo-R^2 value).

CHAPTER FOUR: RESULTS

Several patterns emerged from analysis of this data. These are presented under the following headings: 1) proportion of women screened, 2) description of sample, and 3) association of predictor variables with screening practices.

Proportion of Women Screened

Tables 4.1 and 4.2 indicate the proportions of women screened in Prince George. Thirty-five percent of women between the ages of 40 and 79 reported *never* having had a mammogram and 17% had not had a *recent* mammogram. Similarly, 5% of women between the ages of 18 and 69 reported *never* having had a Pap test and 13% reported not having had a *recent* Pap test.

Table 4.1: Rates of Screening – Mammography (N=186)

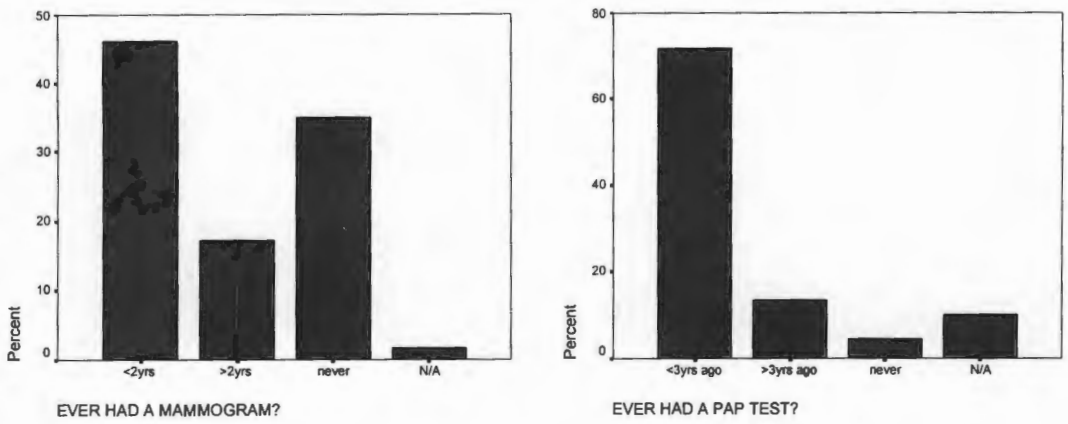
Mammography		N		% of sample	
Ever	**In previous 2 years**	118	86	63%	46%
	Longer than 2 years ago		32		17%
Never		65		35%	
N/A		3		2%	

Table 4.2: Rates of Screening - Pap test (N=418)

Pap test		N		% of sample	
Ever	**In previous 3 years**	357	300	85%	72%
	Longer than 3 years ago		57		13%
Never		19		5%	
N/A		42		10%	

The distribution of screening percentages is illustrated in Figure 4.1.

Figure 4.1: Rates of Screening



The relationship between mammography use and Pap test use was significant, as revealed by a Chi-square Goodness of Fit test (χ^2=10.9, d.f.=1). An examination of 2x2 tables revealed a risk estimate of 9.3 (CI 1.9, 44.5) indicating that those women to have *ever* had a mammogram are 9.3 times more likely to have *ever* had a Pap test. Table 4.3 shows the distribution of women by participation in Pap tests and mammography.

Table 4.3: Cross-tabulation Table: Mammography Use by Pap Test Use
*women age 35-79 years

		PAP TEST		
		< 3 years	**> 3 years**	**Never**
MAMMOGRAPHY	**< 2 years**	17.7%	3.4%	0.5%
	> 2 years	4.8%	3.4%	0
	Never	15.6%	2.5%	2.1%

Note that the percentages of the cells in Table 4.3 do not add up to 100% because this is a cross-tabulation of women ages 35 to 79. Since all women under age 35 were not asked if they had ever had a mammogram, this portion of the sample had 'not applicable' (N/A) codes and are excluded from this cross-tabulation table.

Description of Sample

Table 4.4 indicates the distribution of the mammography and Pap test samples by each social variable. Social characteristics of the samples are similar. For both samples, approximately half of the participants were in the upper-middle to highest income brackets (56% of the mammography sample and 47% of the Pap test sample). Close to one-third of participants had not completed high school and a large proportion of both samples were Canadian born, with 12-19% of women being immigrants. Approximately two-thirds of women lived with a partner (married or common law) and about half were currently working. The only characteristic difference between samples was that a greater portion of the mammography sample reported a disability, that is, 35% of mammography sample versus 22% of Pap test sample. This disability pattern will be discussed in further detail in the following Discussion chapter.

Table 4.4: Characteristics of Study Population

VARIABLES	Mammography sample N=186	Pap Test sample N=418
Mean Age	50	35
INCOME (%)		
lowest (<$10 000)	7%	6%
low-middle ($10 000 – 14 999)	11%	12%
middle ($15 000 – 29 999)	26%	30%
upper-middle ($30 000 – 59 999)	36%	35%
highest (>$60 000)	20%	17%
EDUCATION (%)		
less than high school	27%	28%
high school	17%	18%
more than high school	56%	54%
IMMIGRANT STATUS (%)		
yes	19%	12%
no	81%	88%
DISABILITY (%)		
yes	35%	22%
no	65%	78%
MARITAL STATUS (%)		
Married, common law	67%	60%
single, separated, divorced, widowed	33%	40%
EMPLOYMENT STATUS (%)		
currently working	48%	59%
not currently working	10%	12%
did not work in previous 12 months	42%	29%

Association of Predictors with Screening Practices

Mammography Models

Table 4.5 indicates the overall fit of each of the four mammography utilization models. The regression analyses on the mammography sample revealed that the 7 social variables were not significantly associated with previous mammography use. All p-values are greater than 0.05 and the effect size measures (pseudo-R^2) indicate approximately 10% of variation in mammography use can be explained by the seven predictor variables. These effects are considered small to medium according to Cohen (1992).

Table 4.5: Logistic Regression Analyses – Mammography
* effect sizes are according to Cohen (1992)

MODEL	χ^2	d.f.	p-value	Effect size pseudo-R^2
MODEL 1: NEVER vs. EVER	20.31	14	.12	.090 small-med
MODEL 2: NEVER vs. RECENT	20.28	14	.12	.104 small-med
MODEL 3: NEVER vs. NON-RECENT	12.36	14	.58	.107 small-med
MODEL 4: NON-RECENT vs. RECENT	13.22	14	.51	.101 small-med

Pap Test Models – Overall Fit

In contrast, analyses on the Pap test sample indicate the predictors, as a group, are significantly associated with previous Pap test use. Table 4.6 shows that all p-values are less than 0.05 and effect size measures vary from .10 to .50. For the most part, these effect sizes are large according to Cohen (1992). The 7 social variables, as a group, explain approximately 30% of the variation in women having *never* received a previous Pap test (Model 5). Further, the 7 social variables explain approximately 10% of the variation in women not having received a *recent* Pap test (Model 8).

Table 4.6: Logistic Regression Analyses - Pap test
*effect sizes are according to Cohen (1992)

MODEL	χ^2	d.f.	p-value	effect size pseudo-R^2
MODEL 5: NEVER vs. EVER	39.8	15	.00	.278 large
MODEL 6: NEVER vs. RECENT	45.4	15	.00	.346 large
MODEL 7: NEVER vs. NON-RECENT	39.47	15	.00	.495 large
MODEL 8: NON-RECENT vs. RECENT	28.8	15	.02	.100 small-med

When comparing the overall results of both the mammography and Pap test models, an

important point becomes clear with Table 4.6. The effect size measure for Model 8 is 0.10 meaning Model 8 accounts for 10% of the variation in previous Pap test use. This effect size measure is similar to the effect sizes reported in Table 4.5 with the mammography models. Yet Model 8 is significant and Models 1 through 4 are non-significant. This indicates a possible statistical power problem with the mammography models since the pseudo-R^2 is of significant size (as supported by the significant effect of Model 8) yet the regression analyses detected no group differences. It is possible that the small sample sizes of the mammography models led to a decreased ability of the regression analyses to detect any group differences. This will be elaborated in the following Chapter Five.

Pap Test Models – Significant Parameters

The parameter results of the four significant Pap test models can be found in Table 4.7. Table 4.8 explains the codes used in Table 4.7. The complexity of Table 4.7 can be summed into two main points. First, women are more likely to have *never* had a Pap test if they are immigrants, single, and less educated. Second, women are less likely to have had a *recent* Pap test if they are older.

The most consistent predictor of having *never* had a Pap test proved to be immigrant status. In fact, for each model involving never having had a Pap test (Models 5 through 7), immigrant status was a consistent contributor. Model 5 (*never* vs. *ever*) indicates immigrant women are 7 times more likely to have never had a Pap test relative to non-immigrant women (OR=7.1, CI = 1.9, 26). Models 6 and 7 further support this result.

Table 4.7: Odds Ratios for Significant Models - Association between social predictors and receipt of Pap test.
*significant parameters are shaded

PREDICTORS	MODEL 5 NEVER vs. EVER			MODEL 6 NEVER vs. RECENT			MODEL 7 NEVER vs. NON-RECENT			MODEL 8 NON-RECENT vs. RECENT		
	p	OR	CI (95%)	p	OR	CI (95%)	p	OR	CI (95%)	p	OR	CI (95%)
AGE	**.91**			**.82**			**60**			**.01**		
AGE(1)	.85	1.2	(.2, 6.7)	.57	.57	(.1, 3.9)	.29	5.3	(.24, 118)	.03	3.5	(1.2, 10.4)
AGE(2)	.73	.00	(.00, ∞)	.73	.00	(.00, ∞)	.73	.00	(0, ∞)	.01	4.8	(1.6, 14.7)
AGE(3)	.80	.78	(.1, 5.5)	.38	.36	(.04, 3.4)	.89	.81	(.04, 14.8)	.04	3.7	(1.1, 12.7)
AGE(4)	.62	.58	(.7, 4.9)	.27	.27	(.03, 2.8)	.55	3.4	(.06, 185)	.00	10.8	(2.8, 41.6)
INCOME	**.45**			**.35**			**.43**			**.96**		
INC(1)	.63	.59	(.07, 5.1)	.52	.47	(.05, 4.7)	.76	1.8	(.04, 74.3)	.82	.81	(.12, 5.5)
INC(2)	.12	.15	(.01, 1.6)	.05	.06	(.00, .98)	.90	.77	(.01, 48.5)	.48	.60	(.14, 2.5)
INC(3)	.54	.59	(.1, 3.3)	.26	.33	(.05, 2.2)	.90	1.2	(.07, 21.7)	.47	.68	(.24, 1.9)
INC(4)	.19	.30	(.05, 1.8)	.25	.33	(.05, 2.2)	.20	.12	(.00, 3.0)	.58	.77	(.31, 1.9)
EDUCATION	**.16**			**.05**			**.28**			**.09**		
EDUC(1)	.34	2.0	(.5, 7.9)	.14	3.1	(.68, 14)	.34	.32	(.03, 3.3)	.03	2.4	(1.1, 5.1)
EDUC(2)	.06	4.1	(.97, 17)	.02	7.5	(1.4, 39)	.45	2.7	(.21, 34)	.90	1.1	(.43, 2.6)
IMMIG STATUS	**.00**	7.1	(1.9, 26)	**.01**	7.5	(1.8, 31)	**.00**	62	(13.8, 1017)	**.39**	.63	(.22, 1.8)
DISABILITY	**.57**	.64	(.13, 3.1)	**.33**	.37	(.05, 2.7)	**.99**	1.0	(.1, 10)	**.72**	1.1	(.55, 2.4)
MAR. STATUS	**.00**	10.1	(2.3, 45)	**.00**	22	(3.4, 143)	**.08**	.07	(.00, 1.4)	**.67**	.84	(.38, 1.9)
EMP. STATUS	**.38**			**.35**			**.15**			**.22**		
EMPLOY(1)	.33	.50	(.12, 2.1)	.15	.31	(.06, 1.5)	.92	1.2	(.07, 18.5)	.76	.88	(.39, 2.0)
EMPLOY(2)	.65	1.5	(.29, 7.4)	.68	.67	(.10, 4.5)	.09	16	(.65, 401)	.19	2.0	(.71, 5.5)

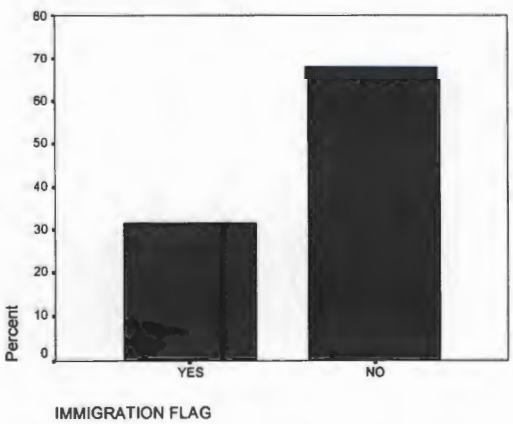
Table 4.8: Code definitions for Table 4.7

CODE		DEFINITION
AGE	AGE(1)	18-29 years vs. 60-69 years
	AGE(2)	30-39 years vs. 60-69 years
	AGE(3)	40-49 years vs. 60-69 years
	AGE(4)	50-59 years vs. 60-69 years
INCOME	INC(1)	lowest vs. highest
	INC(2)	lower-middle vs. highest
	INC(3)	middle vs. highest
	INC(4)	upper-middle vs. highest
EDUCATION	EDUC(1)	less than high school vs. greater than high school
	EDUC(2)	high school graduation vs. greater than high school
IMMIGRANT STATUS		immigrant vs. non-immigrant
DISABILITY		restriction of activity vs. no restriction of activity
MARITAL STATUS		live-in partner vs. no live-in partner
EMPLOY STATUS	EMP(1)	currently working vs. have not worked in previous 12 months
	EMP(2)	not currently working vs. have not worked in previous 12 months

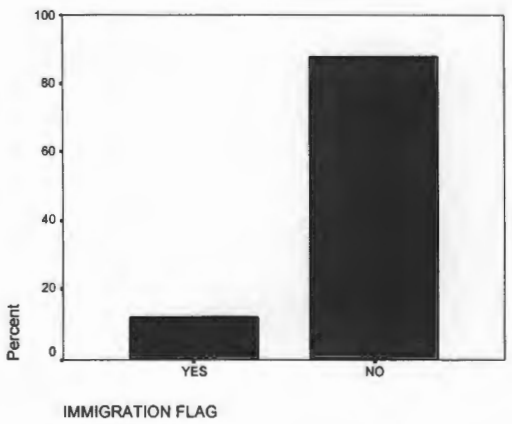
Figure 4.2 illustrates clearly how immigrant women make up a larger proportion of the women who have *never* had a Pap test (30%) compared to women who have *ever* had a Pap test (12%).

Figure 4.2: Unequal proportion of immigrant women by previous Pap test use

*women who have **never** had a pap test*
(N=19)



*women who have **ever** had a pap test*
(N=357)

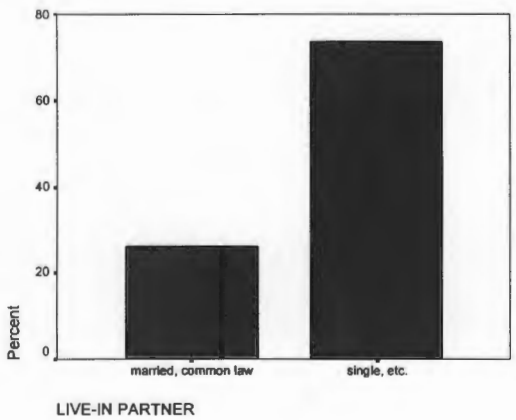


Marital status was another consistently significant contributor in distinguishing those women who had *never* had a Pap test. Marital status was a significant predictor in two of the

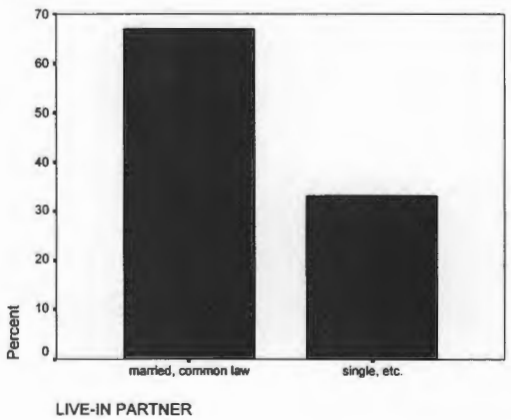
three models involving *never* having had a Pap test (Models 5 and 6). Model 5 indicates women without a live-in partner (i.e., single, divorced, separated and widowed) are 10 times more likely to have never had a Pap test relative to women with a live-in partner (i.e., married women or women living common law) (OR=10.1, CI=2.3, 45). This pattern is repeated in Model 6 where women without a live-in partner are 22 times more likely to have never had a Pap test (compared to having had a recent Pap test) than women with live-in partners (OR=22, CI=3.4, 143). Figure 4.3 illustrates the proportion of women without a live-in partner in the '*never* had a Pap test' group (72%) compared to the '*ever* had a Pap test group' (34%).

Figure 4.3: Unequal proportion of women without a live-in partner by Pap test

*women who have **never** had a Pap test*
(N=19)



*women who have **ever** had a Pap test*
(N=357)



Compared to immigrant status and marital status, education played a smaller role in distinguishing those women who had *never* had a Pap test. Because it was significant in only one of the models involving *never* having had a Pap test (Model 6), education was determined to be less influential in predicting previous Pap test use. Women with a high school education were 7.5 times more likely to have never had a Pap test (relative to a recent Pap test) when compared to women with more than a high school education.

Finally, in terms of the *recency* of receiving a previous Pap test (Model 8), age was the only significant predictor. With increasingly older age groups, the likelihood of a woman having

had a *non-recent* Pap test increased. In fact, women aged 60 to 69 were over 10 times more likely to have not had a recent Pap test than women aged 18 to 29 (OR=10.8, CI=2.8, 41.6).

CHAPTER FIVE: DISCUSSION

In light of the original objective of this thesis, it is clear that certain social factors are influential in determining cancer screening in Prince George. This thesis has identified a number of patterns in mammography and Pap test use. First, social factors examined in this thesis were not associated with receipt of a previous mammogram; yet, in contrast, immigrant status, marital status, education and age were associated with receipt of a previous Pap test. Specifically, women were more likely to have *never* had a Pap test if they were immigrants, single or less educated. For those women who had received previous Pap tests, age was associated with the *recency* of the last Pap test. These patterns will be elaborated in the following paragraphs in light of the concepts of health promotion and a discussion of possible policy implications.

Theoretical Links: Health Promotion and Theories for Participation

As outlined in Chapter One, the key underpinning in health promotion theory is that health is a complex concept with an extensive list of possible determinants. An important component of this idea is that many of the possible determinants of health are factors that lie beyond the control of the individual. The following section will discuss how the findings of this thesis serve to support health promotion concepts.

First, by linking social factors to participation in health practices, this thesis supports the idea that the determinants of health are extensive. With the exception of age (which clearly influences health), significant factors in this thesis (immigrant status, marital status, and education), do not have *direct* influences on individual health, that is, in the sense that biological factors directly determine individual health. Instead, as premised in health promotion theory, social factors in this thesis function in complex ways to affect the health of women in Prince George *indirectly*, thus supporting the idea that the determinants of health are far reaching.

Second, health promotion theory suggests that the determinants of health often include factors that can not be changed through individual behaviors. For instance, it is suggested that poverty is the greatest predictor of poor health worldwide (Beaglehole & Bonita, 1997; Lerer, Lopez, Kjellstrom, & Yach, 1998; World Health Organization, 1998) yet certainly poverty is a factor that can be considered outside the control of the individual. While income did not prove to be a significant predictor in this thesis, the findings of this thesis support the health promotion premise that causes for ill health often lay outside the control of individuals. Like income, the significant variables in this thesis (immigrant status, marital status, education and age) are factors that are beyond individual control yet, for women in Prince George, have significant effects on participation in health services and consequently health outcomes.

The Health Promotion Model (Pender, 1987) and the Socio-Environmental Model (Labonte, n. d.) discussed in Chapter One provide good frameworks through which the results of this thesis can be understood. Using health promotion concepts, these models illustrate the mechanisms through which social and psychological factors determine participation in health promoting practices. Both models suggest the barriers and facilitators of participation are extensive and may include factors such as income, education, immigrant status, and so forth. The ideas of the Health Promotion Model and the Socio-Environmental Model are reflected in the results of this thesis. As suggested by both models, certain social factors in Prince George work as barriers to participation in Pap tests and mammography. Although it was not possible for this thesis to determine the mechanisms through which the significant social factors act on Pap test and mammography participation, this thesis did establish an association between social factors and participation.

Specific Links: Thesis Findings and Possible Policy Implications

Social Determinants of Mammography Use in Prince George

Participation in mammography screening among women in Prince George (63% of the target population) is considerably higher than that reported for the Northern Interior Health Region by the 1996 BC Provincial Health Officer's Report (37% of the target population). In fact, participation is close to that targeted by the Screening Mammography Program of BC (70%). The high participation rates are possibly due to the central location and relatively long history of Prince George's screening clinic. The Screening Mammography Program of BC (SMPBC) opened a permanent clinic at Prince George Regional Hospital in 1991 (personal communication, S. Ottesen, March 3, 1999). Therefore, at the time this data was collected, the clinic had been in full operation for 3 years. Clinics in many other parts of the province did not open until 1994-1995; therefore, the participation rates in other regions were likely not as high as the Prince George participation rates because screening services were not yet available in other areas. Higher participation in mammography in Prince George might also be due to the higher mortality due to breast cancer in this region (as discussed in Chapter One). It is possible that education and recruitment strategies for mammography screening have been enhanced for Prince George and its surrounding areas, which have been identified as high risk areas for breast cancer.

Oddly, the mammography participation rate that is reported in this thesis is dramatically higher than that reported by the 1996 Provincial Health Officer (i.e., 67% versus 37%). This discrepancy is difficult to explain. It might reflect the fact that the 1996 Provincial Health Officer reported a participation rate for the entire Northern Interior Health region whereas the rate reported in this thesis is for Prince George specifically. Possibly, participation in the outlying regions is very low compared to the high rate within the city of Prince George. Therefore, the combination of the low (outlying regions) and high (city) participation rates may

have resulted in an overall participation rate for the region that is similar to that reported by the Provincial Health Officer. At another level, the comparatively high participation rate reported in this thesis may be an artifact of the methodology used in collecting the data. Because the data is self-reported, it is possible that there was an overestimation of participation rates, that is, women may have incorrectly reported whether or not they had previously received a mammogram. Consequently, the participation rates reported in this thesis should be considered preliminary and, in terms of BC health policy, applied with caution. Larger scale studies concerned specifically with assessing mammography participation and utilization (i.e., not secondary analysis) should be conducted in order to obtain accurate measures of mammography participation.

According to the results of this thesis, there is no association between the selected social determinants used in this analysis and mammography use for women in Prince George. Although it is impossible to conclusively explain this outcome, it might have resulted for one of two reasons: 1) the effect of social determinants was not detectable due to the small sample size; or 2) there is no effect of social determinants on mammography use.

As briefly discussed in the Methods and Results chapters, it is possible that the small size of the mammography sample resulted in a reduced ability of the regression analyses to detect any group differences, or in other words, a decreased statistical power. A small sample has a lessened ability to truly represent the population from which it comes; therefore, the fact that no effects were found in this sample may not truly reflect the situation in the actual population. This possibility is supported when comparing the effect sizes of the Pap test models to those of the mammography models. Model 8 of the Pap test sample (which has a comparatively large sample size) has a small to medium effect size similar to the effect sizes found in the mammography samples (which have comparatively smaller sample sizes), yet Model 8 has a significant p-value unlike the mammography models. This suggests that the effect

in the mammography models is the *same* as the effect in the Pap test model, yet the mammography effect was determined to be non-significant by the regression analyses.

The alternative explanation is that there was no effect of social determinants, simply meaning that an effect does not exist. If this is the case, then those women that are participating in mammography services are doing so regardless of their social background. However, having said that, 35% of women in the target population in Prince George have *never* received a mammogram suggesting the presence of barriers other than those examined in this study. Other research has suggested that an important predictor of participation in regular mammography screening is a reminder (i.e., letter or telephone call from the screening facility or physician's office) of an upcoming recommended screening date. In fact, physician recommendation has been found to be the primary predictor of regular participation mammography screening (Johnson, Hislop, Kan, Coldman, & Lai, 1996; Potvin, Camirand, & Beland, 1995; Rimer, Trock, Engstrom, Lerman, & King 1991). Physician recommendation plays such an important role in predicting participation in mammography screening that it is likely to overcome many of the factors associated with low participation, including socio-economic factors (Beaulieu, Beland, Roy, Farardeau, & Hebert, 1996).

The SMPBC uses a letter reminder system to encourage participation in the program. Letters are sent from the central office in Vancouver to women due for screening, informing them of the screening clinics in their area (personal communication, S. Ottesen, March 3, 1999). Other provincial screening programs in Canada send reminder letters to women and to physicians (DeGrasse, O'Connor, Boulet, Edwards, Bryant, & Breithaupt, in press). A possible interest of future research may be to compare the effectiveness of reminder letters to women versus reminder letters to physicians, or even reminder letters to both parties. This could be insightful when developing more effective ways of increasing participation in mammography for women with low participation rates.

Clearly, more research needs to be conducted in order to determine the existing barriers to mammography services. Still, it is important to remember that, according to the results of this thesis, participation in mammography in Prince George is comparatively high; in fact, almost half of the women in the target population have had *recent* mammograms. Given the comparatively high participation in Prince George, it would be wise to study the factors that are facilitators to mammography screening in this population. This might allow insight into ways in which participation can be further improved.

The findings of the mammography portion of this study are not consistent with previous research. The literature review of Chapter Two supports the premise that social determinants are associated with mammography use. Many of the studies examined in Chapter Two use samples that are considerably larger than the mammography sample used in this thesis. For instance, Calle, Flanders, Thun, and Martin (1993) used a sample of 6,353 women, Katz and Hofer (1994) used a sample of 23,521 women, and Ives, Lave, Traven, Schulz and Kuller (1996) used a sample of 2,205 women. This leads this author to suggest that the non-effect from the mammography sample in this study may be due to the small sample size of 186.

Social Determinants of Pap Test Use in Prince George

Eighty-five percent of women in Prince George have *ever* had a Pap test, a participation rate that is the same as the BC average reported by the Provincial Health Officer (1996). In fact, in Prince George, 72% of women reported having had a *recent* Pap test. The high participation in Pap test screening in Prince George reflects a larger nation-wide pattern of participation in Pap test screening. With the exception of particular groups (e.g. recent immigrants, First Nations women, Asian women) participation rates have been fairly consistent in Canada, remaining at approximately 80 to 85% over the last 15 years (Snider et al., 1996). This may be a reflection of the long history of Pap test screening in Canada. A majority of women are familiar with the Pap test procedure and are educated about its purpose. It is possible that Pap tests have become a

regular part of health maintenance for many women and this is reflected in consistently high participation rates.

With a high participation rate of 85%, it appears that women are being well served by Pap test screening services in Prince George. However, while a large percentage of women have been screened, this percentage varies across social groups. Immigrant women, single women, and women with less education are over represented among women who have *never* had a Pap test.

Immigrant status is an important predictor of having *never* had a Pap test in Prince George; when compared to Canadian born women, immigrant women are at higher risk of having never received a Pap test. This pattern has been found in a number of previous Canadian studies (Goel, 1994; Woloshin, Schwartz, Katz, & Welch, 1997), yet has special relevance for BC because of the large number of immigrants living in this province. BC Statistics indicate approximately 900,000 people living in BC are immigrants, with over 200,000 of those arriving since 1991 (BC Statistics, 1996). This represents an immigrant population growth rate of 25%, the fastest growing immigrant population in Canada (BC Statistics, 1996). In terms of Pap test screening, the large and fast growing immigrant population means a likely future increase in the numbers of women who are not receiving Pap tests. An appropriate course of action to curb this problem might involve the development of programs specifically for immigrant women; or more precisely, the development of programs for particular groups of immigrant women. An example of such a program is illustrated by Lovejoy, Jenkins, Wu, Shankland, and Wilson (1989). Their study identified barriers to screening mammography for Asian immigrant women living in San Francisco and developed a screening program that reflected the needs of that particular group. (Note: although Lovejoy and colleagues examined mammography and not Pap tests, their discussion regarding participation for immigrant women is relevant in the sense that both mammography and Pap tests are health promoting practices; this will be elaborated further

in the final sections of this chapter.) They found Asian immigrant women were less likely to participate in screening programs because of cultural beliefs and attitudes. For instance, women were reluctant to have their bodies touched by strangers and believed that the risk of cancer decreases after childbearing years. The screening program involved important members of the Asian medical community in educating women and endorsing the importance of cancer screening. Technicians and other practitioners who spoke the appropriate languages were involved in the actual screening process. Of the 108 women participating in the pilot program, 96 had never been previously screened, indicating a successful start to recruiting the target population.

In terms of this thesis, the NPHS data did provide information regarding the place of birth for immigrant women; however, the type of analyses used for this study combined with the sample size problems did not allow for this information to be included in the analysis. Therefore, the only conclusion that can be drawn from this thesis is that immigrant women in Prince George are at higher risk for low participation. Identification of specific groups of immigrant women with low participation was not possible but a particular interest of future research should be to identify those groups of immigrant women at high risk in Prince George. Once specific groups with low participation are identified, it will be possible to implement the approaches taken by programs such as the one described by Lovejoy and colleagues (1989). Involving members of the target community in the education and recruitment process will encourage greater participation of women from that community.

Furthermore, since participation in mammography is often increased using a letter reminder system, it is likely that this tactic will work to increase participation in Pap tests for those groups with low participation. Again, once specific groups of immigrant women with low participation are identified, it will be possible to mail out reminder letters in appropriate languages that explain the purpose and procedure of a Pap test. Thereby many of the problems

around inaccurate understandings about cancer and importance of Pap tests might potentially be solved. There is currently no letter reminder system for Pap test screening in BC. This is possibly due to the historically high participation rates in Pap test screening in the general population. Consistently high participation in Pap test screening has possibly meant health research and policy making has focussed on health issues that are more relevant for the larger population. However, the consistently high participation rates mask the fact that there are particular groups that are not participating in Pap tests and therefore at higher risk for cervical cancer.

Marital status proved to be another important predictor of having *never* had a Pap test; single women had a much greater likelihood of never having had a Pap test when compared to married and common-law women. The interpretation of this finding is complex and has been addressed by a number of previous researchers (Calle, Flanders, Thun, & Martin, 1993; Goel, 1994). If underuse of screening services is limited to single women who are *not* sexually active, then this may not pose a serious public health problem (Calle, Flanders, Thun, & Martin, 1993). Although all women should begin Pap test screening at age 18, in accordance with the Canadian Guide to Clinical Preventive Health (1994), the most important risk factor for cervical cancer is sexual activity. Therefore, it isn't vitally important for women who are not sexually active to be receiving Pap tests, especially if these women are young (since risk for cancer increases with age). However, certainly there are a large number of single women in the population who are sexually active, yet are not receiving Pap test screening. This poses a more acute public health problem since these women double their risk for cervical cancer if they are sexually active and not being screened.

The discussion of sexual activity here is hypothetical since this thesis had no ability to examine sexual activity. The reason the marital status variable becomes difficult to interpret is because it has an implied element of sexual activity, that is, it is often assumed that women in

regular relationships participate in regular sexual activity. This is an appropriate assumption; however the 'flip side' of this assumption is that women who are *not* in regular relationships are *not* sexually active; this is where the difficulty in interpretation lies. In the context of this thesis, the significance of the marital status variable is two-fold. First, in a positive sense, women in Prince George who are in married relationships and therefore probably participating in regular sexual activity are receiving Pap tests as recommended. Second, there is a large group of women in Prince George, over the age of 18 and therefore in the target population to have Pap tests, who have never had Pap tests. This group likely consists of 1) women who need to be receiving Pap tests, that is those who are sexually active and are not being screened and 2) women who do not necessarily need to be receiving Pap tests, that is those who are not sexually active. It is likely that the first situation is the more common since, according to the BC Provincial Health Officer (1995), fifty-two percent of girls age 17 years have had sexual intercourse.

Because of the emphasis on cervical cancer risk factors related to sexual activity, it may be possible that there is confusion as to whether women who are *not* sexually active should be receiving Pap tests. Although sexual activity is an important risk factor, other factors such as age and smoking are also important risk factors (Canadian Guide to Clinical Preventive Health, 1994). Therefore, younger women who are not sexually active but are smokers should be screened regularly; similarly, older women who are not sexually active but are smokers should *unquestionably* be screened regularly as the risks for cervical cancer increases with age. Although the emphasis on sexual activity as a primary risk factor should remain, the other important risk factors of smoking and age should also be emphasized. Perhaps in this way, those women who are not receiving Pap tests because they are not sexually active and therefore believe they do not require Pap tests, will be encouraged to participate.

In this thesis, the remaining predictor of having *never* received a Pap test was education; women with a high school education were more likely to have *never* had a Pap test when

compared to women with more than a high school education. The education effect in this analysis was unusual since there is no effect when comparing women with *less* than a high school education to women with *more* than a high school education; however the overall effect of education has been found in previous research. Both Katz and Hofer (1994) and Goel (1994) found education to be a significant predictor of having never received a Pap test. This suggests public health education regarding Pap test screening should be presented in a manner that is functional for those with less education. Research has suggested that educational literature regarding cancer screening should be written in a language equivalent to the sixth grade reading level and, in fact, that one-to-one personal contact is sometimes necessary to ensure participation when trying to encourage those with less education (Harper, 1993).

In terms of the first objective of this thesis, that is, what factors are associated with having *never* received a Pap test, it is clear that immigrant women, single women, and women with less education are significantly more likely to have *never* received a Pap test. Yet, it is important to point out that only 5% of women in this sample have *never* had a Pap test. Therefore, significant social determinants of previous screening, such as immigrant status, marital status and education, are relevant for a small, specific group of women. This is not to negate the important role that these factors play in determining previous Pap test screening. Indeed, it is very clear that certain social groups in Prince George need to be recruited into Pap test screening programs. However, in terms of overall participation in Pap test screening, most women in Prince George are receiving the screening that is recommended.

The second objective of this thesis involved examining those predictors associated with the *recency* of the previous Pap test. According to these results, age is the only predictor associated with recency of previous Pap test; women in older age groups are less likely to have received a recent Pap test. This finding is consistent with previous studies such as Goel (1994), Calle, Flanders, Thun and Martin (1993) and Snider et al (1996). The effect of age on decreased

participation in Pap tests is often reported to be a result of decreased sexual activity among older women. Previous research has suggested that, with age, women are likely to become less sexually active and less importance is placed on reproductive health; thereby women attend screening examinations less frequently (Calle, Flanders, Thun & Martin, 1993; Ives, Lave, Traven, Schulz, & Kuller, 1996). However, other researchers have suggested that the idea of older women being less sexually active is false and simply reflects a larger encompassing social myth about older women (McKeever & Martinson, 1986). Older women are often stereotyped as widowed inactive "grannies" who have poor health and are sexually inactive or sexually uninterested (McKeever & Martinson, 1986). It is likely that older women internalize stereotypes such as this and consequently place less importance on their own sexual health. In a similar manner, for older women who have passed their reproductive years, less importance is placed on reproductive health. As a result of internalized stereotypes, it is likely that older women participate in Pap test screening less regularly.

It is important for public education strategies to emphasize the necessity of Pap test screening for older women who are at increasingly higher risk of cancer due to their age. Efforts toward increasing Pap tests among older women should focus on dispelling the myth that older women are less sexually active. Furthermore, although sexual activity is an important risk factor for cervical cancer, as women get older emphasis should lie in informing women of their increased risk *because of their age*; in fact, for older women, the risk of cervical cancer lies more with their age than with their sexual activity. Thirteen percent of women in this study had not received a *recent* Pap test; this represents a potentially large group of the Prince George population of women at increased risk for cervical cancer.

Calle, Flanders, Thun and Martin (1993), in their discussion of the age effect on Pap test use, suggested the low levels of recent Pap test screening among older women might partially be related to the high prevalence of hysterectomies among older women. In this thesis there was no

examination of the prevalence of hysterectomies in Prince George; however, even if there are a large number of women having had hysterectomies in Prince George (which would partially explain the age effect), some of these women should still be screened for cervical cancer. The BC Cancer Agency recommends a woman who has had a hysterectomy for cancer or a hysterectomy in which the cervix is still present should continue Pap test screening (BC Cancer Agency, 1999); therefore, non-participation among older women is problematic, even though some women may have had hysterectomies.

It is interesting to note that the predictors of Pap test screening are different for women who have *never* been screened versus women who have not been screened *recently*. This pattern has been found in other studies (Calle, Flanders, Thun & Martin, 1993) and highlights the complexity of predictors for participation in Pap tests. Different predictors for participation in Pap tests suggest that education and recruitment strategies should be tailored for different functions. In other words, to increase *re-screening*, older women should be targeted, yet to increase *screening in general*, immigrant, single and less educated women should be targeted. In some senses, this pattern also reflects the idea discussed in Chapter Two regarding the socio-economic disparities between *re-screened* samples and *ever* been screened samples. When the *re-screened* Pap test sample was examined in this thesis, the only significant element was age. Otherwise, the re-screened sample was homogenous with respect to social factors, that is, no other social factors were significant. Yet, the sample that examined the entire population of women (i.e. those who have ever and never had a Pap test) produced effects of immigrant status, marital status, and education. This suggests that the women examined for *re-screening* in the Prince George sample were relatively homogeneous in terms of socio-economic status when compared to the women examined in the general *ever vs. never* been screened sample.

Non-significant Social Factors

The discussion of social determinants of participation in mammography and Pap test screening should include a brief reference to those social determinants that proved non-significant in this analysis. The variable of specific relevance in this context is the measure of disability. As mentioned earlier, disability has rarely been studied in this field and this was the primary initiative behind including the disability measure in this thesis. Clearly, disability can be an important contributor in determining an individual's social status and thereby influential in determining health outcome for those with disabilities. In the context of the theoretical models discussed in Chapter One, one can understand how living with a disability can influence an individual's perceptions of health status, perceptions of self-efficacy in health, importance of health, and so forth, which in turn influences an individuals likelihood of engaging in health promoting practices.

The disability variable proved to be non-significant in predicting participation patterns in both Pap tests and mammography. This is an encouraging finding, especially in reflection of the high rates of disability that appeared in this sample. As cited in Table 4.4, twenty-two percent of women aged 18 to 69 (i.e., the Pap test sample) reported having a long-term restriction of activity. This percentage is the same as that reported by the 1996 Provincial Health Officer for this age group; however, the mammography sample in this thesis reported a much higher disability rate, that is thirty-five percent of women age 40 to 79 reported a long-term restriction of activity. Although a large part of this high percentage can be explained by the fact that the mammography sample is older than the Pap test sample, this may also be a representation of the general pattern of poor health in this region. As discussed in Chapter One, people living in the Northern Interior Health Region exhibit high morbidity and mortality compared to people living in other provincial regions. It is very likely that the high rate of disability in the mammography sample is a component of these high morbidity rates.

Overall, despite the high rates of disability in the sample population, the variable proved to be non-significant as a social determinant, indicating that women with disabilities are participating in preventive screening in the same proportions as women without disabilities. This is an encouraging finding for Prince George in light of the high rate of disability and perhaps highlights the effectiveness and accessibility of screening programs with respect to women with disabilities.

Relationship Between Mammography and Pap Test Participation

A final element to the discussion about participation rates in preventive screening practices is the relationship between mammography and Pap test use. For example, in this thesis, women having had recent mammograms are nine times more likely to have also had recent Pap tests. It is not common for research to examine determinants of *both* Pap tests and mammography, which seems to signify a gap in preventive health research considering that both practices are similar components of preventive health. When thinking about Pap tests and mammography within a preventive health framework one can understand how the two practices are related. Pap tests and mammography have similar motivations (to decrease cancer mortality and morbidity) and are targeted at the same group of the population (women). Yet, there has been a general trend in the literature to examine these practices as separate, primarily because the determinants of participation in each are, to a large extent, different. For instance, while sexual activity is the primary predictor of having ever received a Pap test (Goel, 1994), the primary predictor for having ever received a mammogram is physician recommendation (Costanza, 1994; Potvin, Camirand, & Beland, 1995; Rimer, Trock, Engstrom, Lerman & King, 1991). Certainly there are some shared predictors, especially when examining social factors, such as in this thesis; for example, as explained in Chapter Two, income and education have both been found to be predictive of Pap test and mammography use (Katz & Hofer, 1994). For

the most part, however, Pap test and mammography research has been separate due to the apparent differences in determinants of participation in each practice.

The point to be made is that because the practices are examined as separate, different strategies are used to increase participation for each practice. It is suggested here that despite the apparent differences in determinants between Pap test and mammography, strategies aimed at increasing participation should be combined since women that participate in one screening practice also tend to participate in the other.

Pearlman, Rakowski, and Ehrich, (1996) found associations between Pap tests, mammography, and clinical breast exams that were similar to those found in this study; that is, women are more likely to participate in one if they are also participating in another. They suggest a possible need to re-conceptualize participation in preventive screening practices: no longer should Pap test and mammography exist as separate entities, but as equal and related components of preventive health. For example, in light of the findings of this study, older women who do not participate in Pap tests on a regular basis may be encouraged to do so if they are participating in regular mammography screening. If the importance of both practices is emphasized, the factors determining the participation in one test may lead to the participation in the other also.

Yet, as Pearlman, Rakowski, and Ehrich, (1996) point out, the health care system is not designed to accommodate screenings for different types of cancer at one time. In other words, it is difficult for a woman to obtain a Pap test at the same time that she comes in for a mammogram, simply because these two screening tests are offered through different components of the health care system. Having to return for a second screening test creates time, transportation, and financial problems for women (Pearlman, Rakowski, & Ehrich, 1996).

Limitations

A number of limitations to this study should be discussed. First, mammography and Pap test data in the NPHS are self-reported. There is a strong possibility for recall bias with self-reported data: first, in reports of ever being screened, and second in the recency of screening. Inaccuracies in self-reported data can lead to overestimation or underestimation of actual screening utilization rates. A number of studies have addressed validity issues with respect to self-reported mammography and Pap test data. King, Rimer, Trock, Balshem and Engstrom (1990) found a high rate of accuracy among women reporting mammograms; in fact 94% of women accurately reported their last mammogram. Similarly, Sawyer, Earp, Fletcher, Daye and Wynn (1989) found approximately 80% of women correctly reported having ever had a Pap test. Self-reports of *recency* of screening have been found to be less accurate. Gordon, Hiatt, and Lampert (1993) reported self-reports of recency of mammography and Pap tests to be substantially overestimated.

The second limitation of this study is the small sample sizes of the mammography models. As discussed in the beginning of this chapter, small sample sizes means the ability of the regression analyses to detect differences is reduced. In effect, the analyses of the mammography samples had decreased statistical power in detecting significant effects. Therefore, it is difficult to determine whether the non-effect resulting from the analysis of the mammography data is a true effect or a result of inadequate statistical power. The findings from the mammography data must therefore be judged with this limitation in mind.

Summary Contributions of This Thesis

One of the recommended objectives of the feature Women's Health Report within the 1995 BC Provincial Health Officer's Annual Report was to "take steps to ensure that all women receive appropriate screening for cancer of the cervix and that all women ages 50+ receive appropriate mammography screening." (BC Provincial Health Officer, 1995, p. 69) The

recommended action for this objective was as follows: "services such as Pap test and mammography need targeting to groups with low participation rates." (BC Provincial Health Officer, 1995, p. 69) This thesis has made an important contribution to the BC Ministry objectives, most importantly by identifying a number of target groups for Pap test screening in Prince George. For instance, immigrant women, single women and women with less education display low participation in Pap test screening and therefore represent important target groups for future schemes encouraging Pap test participation. Also, this thesis has highlighted the need to target older women in order to encourage continued Pap test re-screening. Hopefully, by targeting groups with low participation, disparities in Pap test screening in Prince George will diminish.

Health research of any kind in northern BC is valuable since northern populations tend to be less healthy overall. This thesis, or in fact any study of health in BC's northern communities, is of special relevance to Prince George which has traditionally not been included in health research. A lack of research facilities, a lack of research funds, and possibly even a lack of interest has meant Prince George and other communities in this region have traditionally been omitted from health research initiatives in BC. The recent addition of the University of Northern BC to Prince George has stimulated the development of research facilities and funding for this community and its out lying regions and has also stimulated an interest in the health of people living in the region.

In the context of other Canadian research, this thesis adds to existing knowledge of Pap test and mammography utilization in a number of ways. For British Columbia, this is the first study to examine social determinants of Pap test screening in the general population of women. Past published research in BC has focussed fairly exclusively on First Nations women only. Further, this is the first examination of social determinants *alone* in relation to preventive screening practices in Canada; other research has tended to examine social determinants in the

context of other predictors. This has meant social determinants were often included as control variables and not as possible primary predictors. An examination of social determinants as primary predictors to participation in Pap test and mammography is important in illuminating the effects of a woman's social background on her ability to participate in health promoting practices. This approach reflects the current theory in Community Health research (i.e., health promotion theory), which suggests improving health in the population should begin with reducing social disparities.

On a theoretical level, this thesis has served to further support the concepts surrounding social determinants of health care utilization and health outcomes. It seems that despite the progressive nature of cancer screening programs in British Columbia, social inequities still work to determine who participates in the health care system and who does not.

Future Areas of Research

In identifying those groups within the community that have low participation rates this thesis has created opportunities for further research in Prince George. Specifically, research following from this thesis should focus on identifying those factors that are barriers to groups with low participation. For instance, what are the specific barriers facing immigrant women in obtaining Pap tests? Further research will indicate whether these barriers are cultural, economic and/or due to language differences. Similar research should be conducted with single women, women with less education, and older women.

The results of this thesis are based on data collected in 1994. Although it is possible that Pap test participation has not changed since this time (Pap test screening has remained steady in recent years), it is possible that mammography participation has increased. The 1996 National Population Health Survey recently became available, which is unquestionably a good source of further information regarding participation in Pap test and mammography services. Unfortunately, Prince George was not over-sampled in the 1996 survey as it was in the 1994

survey; therefore, Prince George was not labeled as different from other regions of the province within the database. Consequently, it would be impossible to select out the Prince George sample from the greater BC sample in order to study trends and determinants of participation in this community. However, compared to the 1994 survey, the 1996 NPHS provides more detailed information regarding Pap test and mammography participation. For instance, those women who had *never* been screened or had not been screened *recently* were asked about the reasons for not obtaining screening. The 1996 NPHS data could provide information about trends in Pap test and mammography participation, identify groups with low participation, and identify reasons for low participation within those groups.

Certainly, further quantitative analyses of national surveys such as the NPHS will provide valuable information regarding participation in screening practices; however, it is the belief of this author that much of the further research in Pap test and mammography utilization should also involve a qualitative methodology. Qualitative research in this field is less common, yet, it is the type of methodology that would be better able to answer the questions that can not be answered through quantitative survey methodologies. Qualitative methodologies could better illuminate the beliefs and attitudes that women experience as barriers to cancer screening. A better understanding of the nuances of screening behavior will allow for the development of more appropriate and effective recruitment campaigns. Additionally, qualitative methodologies such as participatory research may be more appropriate for specific groups of women, especially those who have been historically marginalized. For example, participatory research approaches allow women to be involved in developing strategies for increasing access to and utilization of screening services; the research process itself is intended to be empowering because women are involved in the problem solving process. British Columbia has taken a lead role in moving cancer screening research in this direction. Studies into Pap test utilization by First Nations women in BC have used qualitative methodologies to reveal the details of why First Nations

women do or do not participate in Pap test screening (Clarke et al., 1998; Deschamps et al., 1992). Not only has this research allowed participants an active role in determining the research outcome, it has illuminated important themes in the participation practices of First Nations women (e.g., compared to other Canadian women, First Nations women have different conceptions of what constitutes health promoting behavior). Findings such as these will be useful in designing and implementing culturally suitable cancer screening services in future.

Finally, it has become clear throughout the research of this thesis that a great deal of disparity exists with screening guidelines among provincial and national agencies. For instance, as stated in the 1995 Provincial Health Officer's Annual Report, the BC Ministry of Health aims to increase mammography screening among women 50 to 79 years and decrease screening among women 40 to 50 years. The Canadian Task Force on the Periodic Health Exam recommends mammography screening for women age 50 to 69 years and the SMPBC aims to increase screening among all women 40 and older. Clearly, the primary administrators of screening mammography have different goals, which undoubtedly create confusion among practitioners and patients and are not conducive to increasing screening participation. It is clear there needs to be cohesion among screening administrators and health policy-makers in order to run more efficient and effective programs.

Conclusions

This thesis could make an important contribution to improving health services in Prince George. By identifying those groups with low participation in mammography and Pap test screening, efforts can be made to target these groups. The findings of this thesis follow from previous research that has identified how women from socially disadvantaged groups are less likely to participate in screening practices. From a theoretical perspective, this study further supports the idea that health has comprehensive and complex determinants. Clearly, for the

community of Prince George, social background continues to play an important role in determining participation in health services, and consequently, health outcomes.

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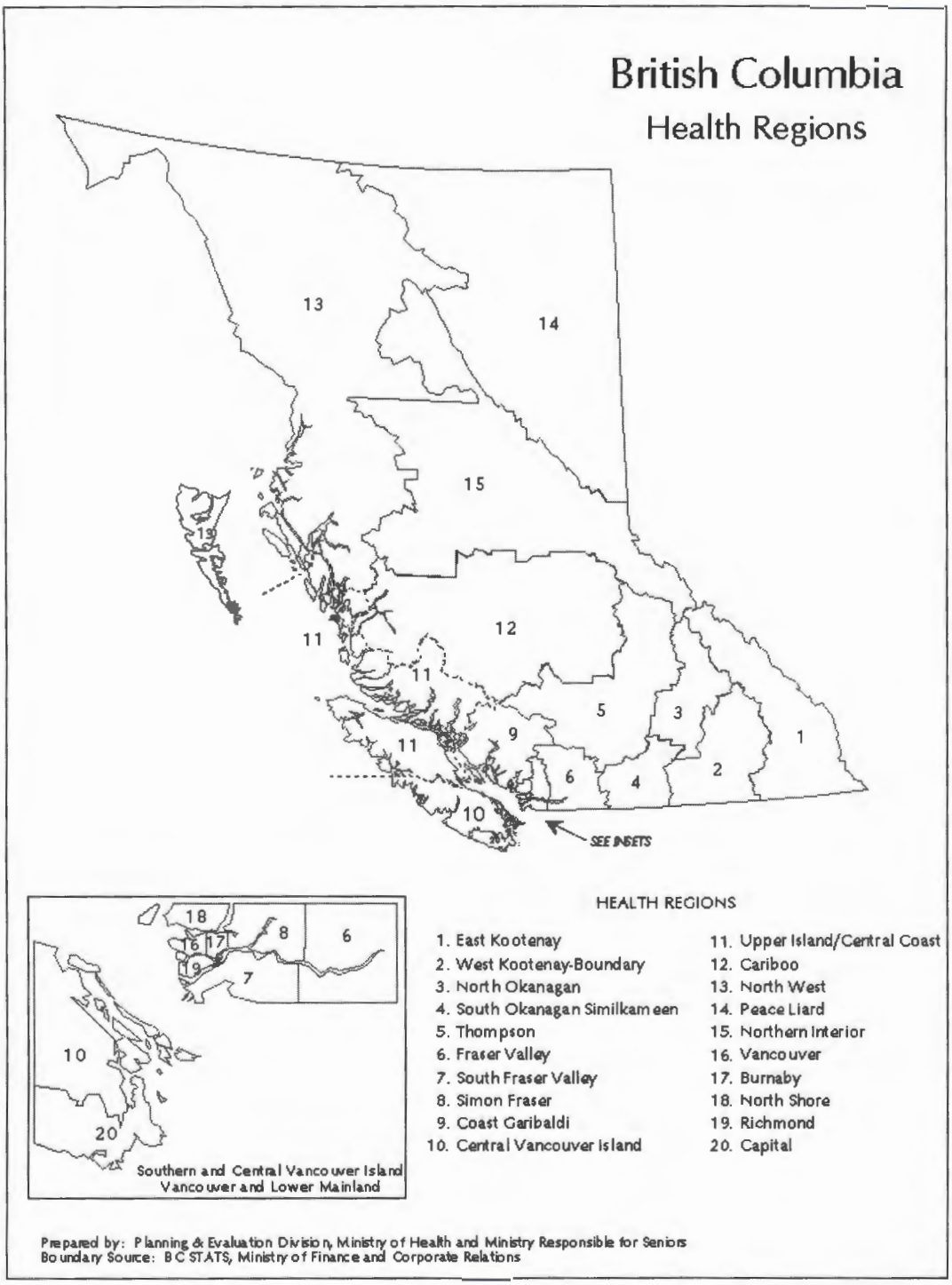
Appendix A: British Columbia Health Regions
source: British Columbia Statistics (1996)



Appendix B: NPHS Questionnaire - Relevant Components
source: Statistics Canada (1995)

Preventive Health Practices Component:

PHP-C2 If sex = female and age >=35 then ask PHP-Q2.
If sex = female and age >=18 and age < 35 then ask PHP-Q3.
If se = male or females <=17 then go to next section.

PHP-Q2 Have you ever had a mammogram, that is, a breast X-ray?

_ Yes
_ No (Go to PHP-Q3)
DK (Go to PHP-Q3)
R (Go to next section)

PHP-Q2a When was the last time?
(Do not read list. Mark only one.)

_ Less than 6 months ago.
_ 6 months to less than one year ago.
_ 1 year to less than 2 years ago.
_ 2 years or more ago.

PHP-Q2b Why did you have your last mammogram?
(Read list. Mark only one.)

_ Breast problem.
_ Check-up, no particular problem.
_ Other (specify _____)

PHP-Q3 Have you ever had a PAP smear test?

_ Yes
_ No (Go to next section)
DK, R (Go to next section)

PHP-Q3a When was the last time?
(Do not read list. Mark only one.)

_ Less than 6 months ago.
_ 6 months to less than one year ago.
_ 1 year to less than 3 years ago.
_ 3 years to less than 5 years ago.
_ 5 years or more ago.

Appendix C: Coding Matrix

Indicator Coding - Contrasts indicate the presence or absence of category membership. Reference category is represented in the contrast matrix as a row of zeros (definition from SPSS Help).

INCOME	INCOME (1)	INCOME (2)	INCOME (3)	INCOME (4)
LOWEST	1	0	0	0
LOWER-MID	0	1	0	0
MIDDLE	0	0	1	0
UPPER-MIDDLE	0	0	0	1
HIGHEST	0	0	0	0